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NEW YORK, THURSDAY, MAY 16, 1872.

$3 PER ANNUM
IN ADVANCE.

Springfield Gas Machine.

The above cuts represents a gas-making apparatus that has, for the last five or six years, been largely introduced in lighting buildings that are situated in the country, and beyond the reach of the coal gas mains of cities. The gas is made by this process from gasolene. An air pump, operated by a weight, forces a constant current of air through this fluid, and makes a carburetted air gas, fully equal to coal gas in its richness and power as an illuminator, and at an expense not exceeding $2 per thousand feet. It is also an equally safe gas to use, as all the inflammable material from which it is made is kept in a vault outside the building any distance—fifty, one hundred feet, or more. Property lighted in this way is insured at the same rates as though coal gas was used.

These machines are lighting the National Armories of the United States, at Springfield, Mass.; at Benecia, California, and by the Government at Rock Island; are in constant use all through the New England, Middle, Southern and Western States; lighting large cotton, woolen, paper, and straw board mills, Britannia, silver plating, clock and pin factories, copper and brass works, rolling mills, bridge works, tanneries, saw and shingle mills, sugar works, public institutions, colleges, asylums, hotels, town halls, blocks of stores, and hundreds of elegant private country mansions with pipes extending to barns and outhouses, lanterns at entrance gates, etc. In short it is used under any and all circumstances that coal gas could be used, and are giving universal satisfaction, alike when exposed to the cold of New England and Canada winters, and to the tropical heat of the summer sun of the extreme south. They can be *relied* upon to the same extent as the coal gas works of our cities.

These machines are simple; are operated by a weight like a clock; are easily managed; not liable to get out of order; are built entirely of *copper*; are durable; are *warranted* perfect of construction.

It often occurs that coal gas companies are called upon to light buildings so far removed from their mains, that they cannot afford to lay the pipes to the same. These machines can be introduced in such cases, both to the advantage of the gas company or the consumer.

We want good, responsible, and practical men to introduce these machines on commission, throughout the United States, and also abroad. Parties wishing to act as agents are invited to correspond with us, and to apply for circulars to

THE GILBERT & BARKER MAN'F'G CO.,
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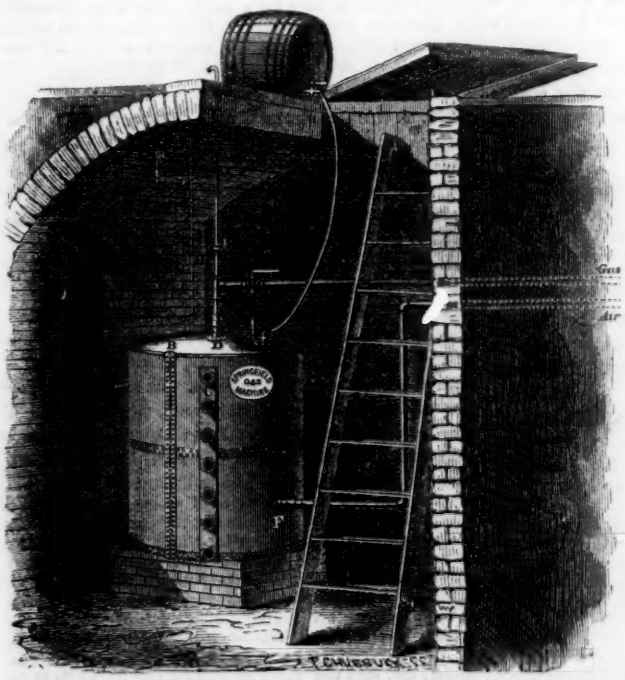
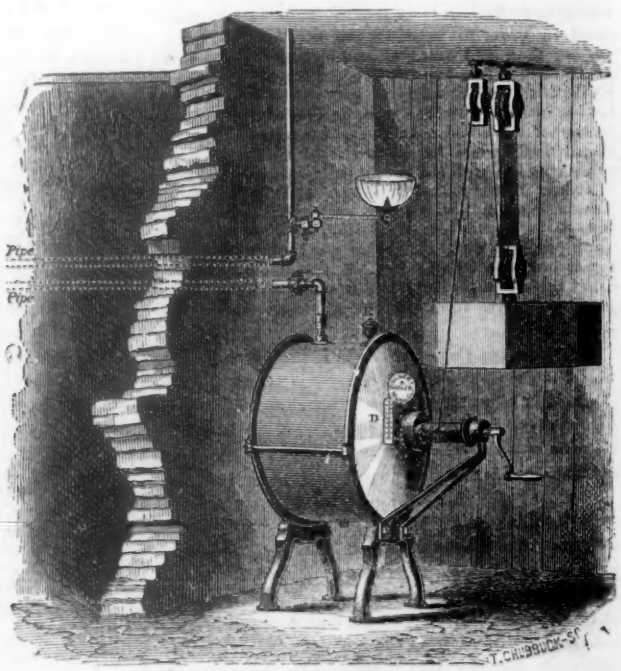


GAS GENERATOR IN A VAULT OUTSIDE THE BUILDING, 50 FEET OR MORE.



AIR PUMP IN THE CELLAR OF THE HOUSE.

BOSTON was the second city of the Union to use illuminating gas, and Baltimore the first.

Artesian Wells on the Western Plains.

It is asserted that the garrison at Fort Russell, Wyoming Territory, have need of a more permanent source of water supply, and an effort is being made to secure from Congress an appropriation of $10,000 to sink an artesian well. Aside from the chance of providing water to the post, the outlay would be well applied in determining whether, in that region, reliance can be had upon artesian wells for the water needed for irrigation, if not for large fields, at least for gardens and orchards. The experiment is by many thought to have but doubtful chances of success, while, on the other hand, it is a cherished theory on the dry plains that subterranean reservoirs lie below, and only need to be pierced by a boring tool in order to water the arid soil until it is green with grass and bright with fruit and flower. If the government trial should be made and prove successful, private capital would soon multiply the number, and add marvellously to the agricultural resources of hundreds of square miles of land that is now of little value. The amount required is but a small proportion to the benefits hoped for from its expenditure; the sinking of wells in Llano Estacado some years since by the government furnishes an apt precedent; and, all things considered, it is to be hoped that the attempt to solve the problem of watering the desert by deep-sunk wells should meet with the assistance asked for.—*American Artisan.*

Chemical Repertory.

No. 68.— May 16, 1872.
EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

261. New Artesian Well.—Government has leased a building for three years of the Messrs. Farwell, at $25,000 a year, for the Federal offices, other than the port. It is located on La Salle street, about half way between Madison and Monroe, and was but partially destroyed by the fire. This firm have been for three or four months boring an artesian well at their new store, corner of Franklin and Market streets. A few days since, at a depth of twelve hundred feet, they struck a branch of Noah's flood, which came pretty near drowning out the establishment, throwing up one thousand gallons a minute through a five inch tube.—*Chicago, Nov.* 30

262. Kitchen Lore.—All the tasting ingredients of flesh reside in its juices and not in the solid substance. If the flesh of a deer, an ox, a pig, a cat, or a fox be well squeezed, so as to express their juices, what remains has the same vapid taste for all of them. For this reason roasted or stewed meat is generally better flavored than boiled, and the cook protects the juices by pouring melted fat over the joint during its roasting. In boiling meat for soup, cold water should be used at first, so as to extract as much of the nutritive juice as possible, and the heat be raised gradually. But if the meat be wanted in a boiled state for itself and not for its soup, then it should be plunged at once into boiling water, and kept boiling for a few minutes, so that all the outer albumen may be coagulated, in order to imprison the sapid and nutritive juices; then cold water should be added till the temperature is reduced to 160 degrees, at which it should be kept till the cooking is completed, because that heat is necessary for the coagulation of the coloring matter of the blood. In all cases, no more heat than is sufficient should be employed in cooking. Thus, in making soup, all the fire in the world will not make the water hotter than its boiling temperature, at which point it can be retained by a very moderate expenditure of fuel. Violent ebullition, such as we cooks often practice, while it does no good, often does much harm, not only by wasting fuel, but also by carrying off in the steam much of the aromatic and volatile ingredients of the food.—*Scientific Press.*

263. Voltaic Corrosion.—In the recent investigation into the circumstances connected with the loss of the British iron-clad Megæra, it was shown in evidence that the washing about of a copper nail in the bilge of the iron steamer Grappler destroyed one of her plates, and nearly caused her to founder.

264. Gas-absorption by Charcoal.—Dr. Vohl, of Cologne, has recently investigated this important property of charcoal, in which he arrived at the conclusion that the carbonic acid gas obtained by heating charcoal is not derived from the coal itself, but that it has been absorbed from the atmosphere, and is held with such tenacity that it cannot be driven out by boiling water; but that a temperature much below that of ignition is sufficient to expel it; and to prove the correctness of his conclusions, he finds that when charcoal has been freed from its carbonic acid and saturated with pure oxygen, no trace of carbonic acid is appreciable, even though it be heated to a temperature of 680 degrees Fahrenheit.—*Am. Exch. and Review.*

265. Sulphur from Sulphuretted Hydrogen.—According to the invention of Mr. Walter Weldon, of Putney, the sulphuretted hydrogen is caused to react upon oxide of iron, or oxide of manganese, more readily and more completely than by any method hitherto employed, by injecting the sulphuretted hydrogen into water, holding the metallic oxide in suspension. into the product thus obtained atmospheric air is then injected, whereby a mixture of metallic oxide with free sulphur is produced. Into this mixture more sulphuretted hydrogen is sent, and the product is then treated with air as before. These alternate treatments, first with sulphuretted hydrogen and then with air, are repeated until a mixture is obtained containing a very large proportion of free sulphur. This sulphur can then be separated by any one of a variety of ways. Soda and potash are manufactured by forming sulphides of sodium or potassium, decomposing these by carbonic acid, and treating the resulting sulphuretted hydrogen as above described. What is known as "alkali waste" is also decomposed by any suitable acid or by steam, and the resulting sulphuretted hydrogen treated as aforesaid. The invention is also applied to nascent sulphuretted hydrogen.—*London Mining Journal.*

266. The Past Winter.—So intensely cold was the weather in parts of New England, that actual examination proved the ground to have been frozen to a depth of five feet. In Pennsylvania the frost penetrated to a depth of three feet.—*Daily Paper.*

267. Miners' Prejudices.—For four years there has been a continual strife between the miners of the Pacific coast and their employers, on the question of using what is known as "giant powder" instead of the regular blasting-powder. On the one hand it is claimed that the use of the "giant" article facilitates and cheapens rock excavations, that it is especially serviceable in wet m nes, and that no deleterious effects are produced by its use. The miners insist that it is injurious to the health and does no more execution than the common black powder. Physicians, however, do not consider it injurious, and experiment proves its superiority in certain contingencies Yet a strike is sure to follow its introduction, although, when it has been used without the knowledge of the miners, it has been followed by no evil effects.

268. Supplying Fuel to Furnaces.—The invention of Mr. Samuel Danks, of Cincinnati, U. S., relates to supplying coal to a furnace or grate requiring a high temperature, by means of one or more revolving augurs, in such a manner that, first, the combustion of coal so fed is more perfect than when the coal is fed in the ordinary way, and by this more perfect combustion, heat is economised. Second, slack or fine coal, as well as coarser coal, may be fed to the furnace, and with equally good results. Third, a continuous supply of coal may be kept up. Fourth, much labor is saved in putting the coal into the grate. In these respects the said invention is greatly superior to the methods of firing furnaces and fireplaces now in use.—*Lond. Mining Jour.*

269. Cooking without Fire.—At Smoky Valley, Oregon, the people do not have the trouble of making a fire when they wish to get breakfast. They just walk out with their kettles, coffee-pots, and whatever else, and cook at the boiling spring. The water seems a great deal hotter than common boiling water, and all they need to do is to hang their kettle in it for a short time, and their food is nicely cooked. They are able even to bake in it. The bread is put into a tight sancepan, and lowered into the boiling flood for an hour or two, and then drawn up most exquisitely baked. It takes but a minute to cook eggs, or to make a pot of coffee or tea; but if there should happen to be a "slip between the cup and the lip," food would be gone beyond recovery.

270. Flavor of Butter.—The German *Agriculturist* says that a great portion of the fine flavor of fresh butter is destroyed by the usual mode of washing, and he recommends a thorough kneading for the removal of the buttermilk, and a subsequent pressing in a linen cloth. Butter thus prepared, is pre-eminent for its sweetness of taste and flavor, qualities which are retained for a long time. To improve manufactured butter, we are advised by the same authority to work it thoroughly with fresh cold milk, and then to wash it in clear water; and it is said that even old and rancid butter may be rendered palatable by washing it in water to which a few drops of a solution of chloride of lime have been added.

271. Fire-Damp.—A correspondent of the *London Mining Journal* says:

In last week's Journal a correspondent asks if it be not possible by decomposing fire-damp to avoid danger of explosion, without removing the gas by ventilation. It is not impossible to burn the gas quietly—in fact, much of it is so burnt in safety-lamps, giving very clear indications of its presence—but if all the gas in a highly explosive mixture of fire-damp and air were burnt, choke-damp would be formed, and the men, though not scorched, would be suffocated.

The most explosive mixture consists of ten volumes of air (containing two of oxygen) with one of carburetted hydrogen: after explosion and cooling the product would be eight volumes of nitrogen, one of carbonic acid, with water and watery vapor. In such a mixture men would be drowned; but even supposing only about two-thirds the proportion of fire-damp (and with less the mixture would not explode), there would be found if the fire-damp were burnt 6.6 per cent. of carbonic acid, and only the same proportion of uncombined oxygen, which mixture men could breathe for a very short time only. I see nothing for it but the removal of the fire-damp, so that mine air shall not be explosive, with the temporary suspension of coal getting and of powder blasting, whenever the ventilation is insufficient for such removal, until it is rendered sufficient. We must make our choice between a trifling, and to the consumer an imperceptible, increase in the cost of coal getting, for proper ventilation; and while it is insufficient, temporary suspension of work—as proposed by your correspondent, "Philo," last week—or bearing with the continuance of disasters that are a disgrace to civilisation, to humanity, and to religion, as they might in the great majority of cases, though not in all, be effectually prevented.

272. Prepared Corn-Cobs.—A very convenient kindling wood is made in France from corn-cobs, by immersing them in a mixture of sixty parts of melted resin and forty parts of tar; after which they are taken out and allowed to dry. They are then subjected to a second operation, weich consists in spreading them out on a metallic plate heated to 212° Fahrenheit. They are finally assorted according to size, and tied up in bundles. These are sold at the rate of three or four for a cent. The establishment in Paris for manufacturing them employs 30 workmen, and effects sales to the amount of $40,000 annually.

273. A Simple Night Light.—When, as in case of sickness, a dull light is wished, or when matches are mislaid, put powdered salt on a candle till it reaches the black part of the wick. In this way a mild and steady light may be kept through the night by a small piece of candle.—*Sci. Am.*

274. Water for Cooking.—The effects of hard and soft water in cooking vegetables vary materially. Peas and beans cooked in hot water, containing lime or gypsum, will not boil tender, because these substances harden vegetable caseine. In soft water they boil tender and loose a certain rank, raw taste which they retain in hard water. Many vegetables (as onions) boil nearly tasteless in soft water because all the flavor is dissolved out. The addition of salt often checks this (as in the case of onions) causing the vegetables to retain the peculiar flavoring principles, besides much nutritious matter which might be lost in soft water. Thus it appears that salt hardens the water to a degree. For extracting the juices of meat to make a broth or soup, soft water, unsalted and cold at first, is best, for it much more readily penetrates the tissues; but for boiling meat where the juices should be retained, hard water or soft water salted is preferable, and the meat should be put in while it is boiling so as to seal up the pores at once.—*Scientific Press.*

275. A Wasting and Consuming Fire.—Eighteen hundred vessels are employed, irrespective of railroads, in conveying 5,250,000 tuns of coal annually to warm the city of London.

276. Sunflower Light.—In Russia the sunflower is cultivated for its seeds, which yield an oil that is largely used for culinary purposes, for burning in lamps, for soap-making, and as a vehicle for paints. One acre will produce fifty bushels of seed, yielding on an average fifty gallons of oil. In 1867 the Russian product of this oil amounted to nearly 17,000 tuns.

277. Carbolic Paper.—As a simple method of employing carbolic acid, C. Homburgh, of Berlin, proposes to saturate sheets of coarse millboard with the disinfectant in question. The sheets may be hung up in the rooms requiring purification, or a small piece may be torn off when a small quantity only of carbolic acid is wanted. Sheets of millbo ard, having

an area of about seven square feet, and containing about one-fifth of a pound of carbolic acid, are sold in Berlin for a shilling apiece.—*Sci. Am.*

[The above is an American invention, covered by a patent issued five or six years ago to Eames and Seely.—ED.]

278. SUBSTITUTE FOR CURLED HAIR.—The curling of "soap-root" as a substitute for hair mattresses is quite an industry in California. It employs a capital of nearly $50,000, with sixty men, and machinery and engine of 40 horse-power. The value of the product is nearly $100,000 annually, and is steadily increasing. because this material is the best substitute for hair ever discovered, and grows in unlimited quantities in all the foot hill districts of the State.—*Exchange.*

279. FORMATION OF NITRATE OF AMMONIA IN RESPIRATION.—Dr. Struve states that, by breathing for some moments in a large sized beaker-glass previously moistened with water, and next rinsing the glass with some pure distilled water, this liquid will be found, by the usual tests, to contain ammonia and nitric acid. This formation of nitrate of ammonia is stated to become increased after dinner has been taken. The author is of opinion that atmospheric nitrogen is not entirely passive in the process of respiration, but it should be observed that this opinion is contradicted by the direct experiments of Drs. Regnault and Reiset.

Report on Sulphur-Purification at the Beckton Gas-Works, by the Gas Referees.

TO THE LORDS OF THE COMMITTEE OF PRIVY COUNCIL FOR TRADE.

[Condensed by Editor of this Journal.]

21 JOHN STREET, ADELPHI.
January 31, 1872.

The Gas Referees have the honor to submit to the Board of Trade the following Report on the Sulphur Purification at the new gas-works at Beckton.

It is important to state at the outset that this report relates exclusively to that portion of the sulphur in gas which exists *in other forms than Sulphuretted Hydrogen.* Of sulphuretted hydrogen not a trace has ever been been found in the gas supplied to the public from the Beckton works, although the testing to which it has been daily subjected has been exceedingly stringent. Sulphuretted hydrogen is absolutely prohibited, under penalty, by the London Gas Acts; and reasonably so, for there is no difficulty whatever in wholly eliminating this impurity from gas. When the Gas Referees entered upon their duties in 1868, they extended the period of testing for this impurity from "one minute," as prescribed in the Act of 1860, to the whole period of the testings for illuminating power—namely, [illegible] three or four hours. Thereby the testing was made much more effective—for sulpuuretted hydrogen acts cumulatively on the test-slips; so that, although no fouling of the test-slips may take place in one minute, or even in an hour, the presence of this impurity in the gas may become apparent when the testing (as is now the case) is made continuously for a longer time.

PART I.

At the Beckton Works all the apparatus for purifying the gas is on an unusually extensive scale; and the magnitude of the "Purifiers" greater than those employed in any gas-works in the kingdom. Accordingly it was confidently expected by the eminent Chief Engineer of the Chartered Company that the amount of sulphur in the gas manufactured at Beckton would be greatly below what it had been in the old works of the company.

Unfortunately the result has not only fallen short of these expectations, but has proved a complete and most startling failure.

COMPARATIVE VIEW.

The purifiers at Beckton are all under cover, being roofed over; so that they are less liable to be disturbed in their action by variations of temperature than those at Bow Common and some of the other gas-works, which are uncovered and open alike to sunshine and shower. They are arranged in separate houses—each house containing 12 purifying vessels; and each house is reckoned adequate to purify a make of gas of 125,000 feet per hour. At present two purifying houses are in operation at Beckton.

		1. Area of Purifiers.	2. Make of Gas per hour	3. Area per 1,000 feet of hourly make.
South Metropolitan Company.		3,324 square feet.	130,000 cubic feet.	25·5 square feet.
Imperial Company.	Haggerston.	5,278 square feet.	250,000 cubic feet.	21·1 square feet.
	St. Pancras.	5,606 square feet.	230,000 cubic feet.	24·3 square feet.
	Fulham.	9,932 square feet.	350,000 cubic feet.	28·4 square feet.
Chartered Company.	Bow Common.	4,732 square feet.	120,000 cubic feet.	37·7 square feet.
	Blackfriars.	3,166 square feet.	125,000 cubic feet.	25·3 square feet.
	Curtain Road (*now closed*).	4,615 square feet.	19,000 cubic feet.	24·3 square feet.
	Brick Lane (*now closed*).	2,444 square feet.	95,000 cubic feet.	25·7 square feet.
	Westminster.	6,236 square feet.	200,000 cubic feet	31·18 square feet.
	Beckton.	11,780 square ft.	250,000 cubic feet.	47.1 square feet.

The superficial area of purifiers (rather than their cubical volume) is the exponent of their purifying capacity. The purifiers in all the London gas-works are at least six feet deep, and, in actual practice, no addition to this depth can make any addition to their capacity for purifying—seeing that about four feet in depth of material in any purifier is the greatest that can conveniently be used, owing partly to the "back-pressure," or resistance of the material to the passage of the gas, and also to the difficulty in changing the contents of these vessels if a greater depth of material, or number of trays used in each.

Taking the Haggerston works as the unit of comparison, the purifying power, as represented by the area of the purifiers, of these several works, relative to the maximum make of gas, stands as follows:

Haggerston, 1; St. Pancras, 1.15; Curtain Road, 1.15; South Metropolitan, 1.2; Blackfriars, 1.2; Brick Lane, 1.21; Fulham, 1 34; Westminster, 1.47; Bow Common, 1.78; Beckton, 2.2.

The Beckton Works, owing to their locality, have a superiority over all the other London gas works, except those at Bow Common, in being able to make free use of lime as a purifying material.

FIRST MODE OF PURIFICATION.

Up to the beginning of August last, the make of gas at Beckton did not exceed 100,000 feet per hour; and in consequence during that period only one purifying house was in operation. Of the 12 purifiers then in use, 8 were filled with oxide of iron and 4 with lime; and in order to facilitate the re-charging of the purifiers, and thereby economise labor, the material in each purifier was arranged in a single tray 24 inches in depth.

Two opposite opinions have been maintained as to the best manner of using lime and oxide of iron in combination as purifying agents; one opinion being that the oxide should be placed before the lime, and the other that the lime should be placed first in the series. Although the referees entertained no doubt that it is better to pass the gas through the lime before entering the oxide,* it was thought advisable by the engineer of the Chartered Company to try the other system at first, especially for this reason, that by using the oxide of iron *before* the lime at Beckton, while it is placed *after* the lime at the Bow Common works of the same company. it would be clearly and definitively determined which of the two processes is the more efficient.

The Beckton Works were opened and came partially into operation in December, 1870, and the inefficiency of the sulphur-purification at these works soon became apparent in the increase of sulphur in the gas supplied to the city. At that time the city was supplied from six separate gas-works, all belonging to the Chartered Company; namely, the works at Westminister, Blackfriars, Brick Lane, Curtain Road, Bow Common, and Beckton. The gas from Bow Common, being supplied through a separate system of pipes, has remained unmixed; but the gas from all these other works is liable to be mixed with that from Beckton; and as regards Curtain Road, Brick Lane, and Blackfriars, the gas was gradually intermingled with that from Beckton to a large extent. Moreover, in accordance with Act of Parliament, the Curtain Road and Brick Lane works were closed in the spring of 1871, their place thereafter being wholly supplied by the Beckton Works. The effect of this, as regards "sulphur," is shown in the following table:

SULPHUR IN THE GAS SUPPLIED TO THE CITY.

Average for September, October, November and December, 1870.

Curtain Road.	Brick Lane.	Blackfriars.	Westminster.	Bow Common.
26.5	30.9	23.2	27.8	20.0

For June and July, 1871.

Beckton.	Blackfriars.	Westminster.	Bow Common.
June...43.9	34.2	27.7	15.9
July...42.5	36.4	34.3	20.9
Av'g...43.2	35.3	31.0	18.4

Here it is shown that the gas made at Beckton, instead of being purer, was actually fouler with sulphur than that made at any of these other gas-works; and the invasion of the gas from the new works is plainly shown by the gradual increase of sulphur at the various testing-stations for the above named works—Bow Common excepted.

* On this as well as on other points connected with sulphur purification *in general*, the full investigations of the referees, including the experiments made in their laboratory, will be given in a separate report; but, as a sample of the result of their experiments on the question alluded to above, they give here two sets of testings, made at the Fulham Works by the eminent experimentalist and Engineer of the Imperial Co., Mr. Kirkham:

LIME BEFORE OXIDE.

Five Purifiers.	Sulphur per 100 feet of gas. At Inlet.	At Outlet.
	Grains.	Grains.
1st. Very foul Lime	39.45	10.52
2d. "	38.7	19.73
3d. Clean Lime	38.86	10.54
4th. Oxide of Iron	40.96	12.11
5th. " "	36.96	6.48
	36.68	11.73
	36.84	11.5
Average	38.36	11.8

OXIDE BEFORE LIME.

Four Purifiers.	Sulphur per 100 feet of gas. At Inlet.	At Outlet.
	Grains.	Grains.
1st. Oxide of Iron	32.67	26.0
2d. " "	35.73	25.15
3d. " "	35.8	27.91
4th. Lime	33.45	30.44
	30.0	23.01
	29.47	23.47
	30.66	24.03
Average	32.54	25.7

N. B.—The circumstances under which these experiments were made, renders it probable that the action of the purifying material was greater than that which can be counted upon, in the ordinary process of purification.

PRESENT MODE OF PURIFICATION.

In the month of June, considering that the method of sulphur-purification adopted at the Beckton works, and above described, had been fully tried and failed, the referees requested the company to alter their system, by placing the lime *before* the oxide of iron. At the same time each purifier was fitted up with four trays (instead of only one, as at first), each six inches deep, an alteration by which, although no more purifying material was used than before, the "back-pressure" (*i. e.*, the resistance offered to the passage of the gas), so inconvenient in gas-making, was lessened, and also the gas was better able than before to pass equably through the purifying material, thereby exposing it more fully to the purifying action of the material. The quantity of lime used was at the same time doubled in amount, by displacing the oxide of iron from four of the purifiers and charging them with lime.

These alterations were completed, and the new mode of purification came into operation in the beginning of August. At the outset the result was most successful and gratifying; the sulphur for some weeks averaging only 10 to 15 grains per 100 feet of gas. The third week in September, however, the sulphur went up to 18, the fourth week to 35½, and during the last three days of that month to 41 grains, and ere long became as great as before.

The referees have been in constant communication with the chief engineer of the company, as well as with the manager of the Beckton works, and they have closely inspected the above-mentioned changes in the mode of purification. As the matter is one of unusual importance, they think it right to describe minutely the whole of this case.

In the beginning of August, when the above-mentioned alterations were completed, the make of gas at Beckton averaged barely 100,000 feet per hour; and, accordingly, only one purifying-house was then in action. Of the 12 purifiers in this house, eight were charged with lime—each purifier being fitted with jour trays, and each tray being charged with six inches deep of lime; and four were charged with oxide of iron, in four trays with six inches of oxide in each tray. The purifiers were arranged in three sets, each set comprising four of these vessels; and the gas was allowed to distribute itself simultaneously through the first two sets, charged with lime, and thereafter was passed through the third set charged with oxide of iron. Only three purifiers in each set, or nine in all, were simultaneously in operation—the other three purifiers being kept in reserve, filled with fresh material, ready at any moment to be put into action when required. Omitting for the sake of simplicity, the details of the apparatus, the course of the gas through the purifiers was as follows:

MAIN FROM THE PURIFIERS.

MAIN FROM THE SCRUBBERS.

The reason why the gas is thus passed simultaneously through the first and second sets of purifiers is, that the "back-pressure" would be too great if the whole of the gas were made to pass in succession through both of these sets. Also, by thus splitting the gas into two streams, the greater part of the gas will naturally take its way through the one of the two sets where the back-pressure is least, and also where (as will be explained in the sequel) the lime exists to a lesser extent in the form of carbonate, and therefore is in better condition for acting on the sulphur.

In the month of September, owing to the increase in the make of gas, the second purifying house was put in action—the arrangement of the purifiers, and the mode of passing the gas through them, being exactly the same as in house No. 1, shown in the above diagram.

Under this new arrangement, the gas is passed *first* through the lime, and thereafter through the oxide of iron. The superior efficiency of this arrangement over the other consists in this, that *clean* lime has no appreciable effect in eliminating the "sulphur," *i. e.*, the sulphur-compounds other than sulphuretted hydrogen;* the lime has to be fouled by sulphuretted hydrogen (*i. e.*, converted into sulphide of calcium) before it has this effect. Now, this "fouling," or conversion of the lime into sulphide, cannot be attained if the oxide of iron is used *before* the lime, for the sulphuretted hydrogen is taken out by the oxide; so that the lime, through which in this case the gas passes subsequently, is never converted into sulphide, and therefore cannot act upon the "sulphur." But, when the gas is passed into the lime before passing through the oxide of iron (in other words, while the gas is still charged with sulphuretted hydrogen), the lime absorbs the sulphuretted hydrogen, thereby becoming sulphide of calcium, in which condition it tends to absorb the sulphur as it exists in the gas in other forms than sulphuretted hydrogen.

* Wherever the word sulphur within inverted commas (thus "sulphur") occurs in this report, it is used to signify sulphur in other forms than sulphuretted hydrogen. Indeed, as stated on p. 1, it is only with sulphur in other forms than sulphuretted hydrogen that this report has specially to deal.

At first, as above shown, the effect of this new arrangement, combined with the disposal of the purifying material in several shallower trays instead of in a single deep one, was very satisfactory; but when in the course of a few weeks the amount of sulphur in the Beckton gas became almost as great as before, the referees undertook a still more searching investigation. The chief records of this investigation are comprised in tables in an appendix, wherein the processes of sulphur-purification at the Beckton works are given in fullest detail. These voluminous tables we cannot afford room for, but the chief points worthy of notice are summarised in the following statements:

COMPARISON BETWEEN BECKTON AND BOW WORKS.

The only other gasworks in London where lime and oxide of iron are, or can be, used together as they are at Beckton, are the works at Bow Common—at which works also, as already stated, the size of the purifiers, relative to the make of gas, most nearly approaches to that in use at Beckton, being only 20 per cent less.

	Number and Area of Purifiers.		Arrangement and Quantity of Material in each Purifier.		Quantity of Purifying Material per 1000 ft. of hourly Gas-make	
	Lime Purifiers.	Oxide of Iron Lurifiers.	Lime.	Oxide of Iron.	Lime.	Ox. of Iron
Beckton (2 Houses.)	16, =7,854 square feet.	8, =3,927 square feet.	4 trays, ea. 6 in. deep	4 trays, ea. 6 in. deep	62·8 c. ft.	31·4 cu. ft.
B. Common	3, =2,028 square feet.	4, =2,704 square feet.	4 trays, ea. 5 in. deep	2 tr'ys 20&18 in. deep	28·05 c. ft.	71·3 cu. ft.

Here it appears that the contents of the lime purifiers used at Beckton, relative to the make of gas, are more than twice as great at Beckton as at Bow; and that the contents of the oxide of iron purifiers at Bow, relative to the make of gas, are more than twice as great as at Beckton.

But in order to complete these statistics and arrive at a reliable comparison, it is necessary to note how often the contents of the purifiers are changed at these works; for it is obvious that smaller purifiers, if their contents are more frequently changed, *may* be as efficacious as larger ones which are less frequently charged with fresh material. This is perfectly the case with lime as regards the main portion of the sulphur in the gas, viz. sulphuretted hydrogen; but as regards the sulphur in other forms, the changing of the material in the purifiers is advantageous only up to a certain point; for, as above stated, *clean* lime is inoperative upon sulphur in other forms than sulphuretted hydrogen, its action upon this form of the sulphur-impurity only commencing after it has been "fouled," *i. e.*, converted into sulphide of calcium.

[To be continued.]

Report Upon the Grand Central Hotel Gas.

By William Wallace Goodwin.

The following statement has been communicated to us, with a request for publication. Some editorial remarks will be found in their proper place:

New York, April 11, 1872.

B. P. Brunner, Esq.,
Engineer, City Gas Works,
San Francisco, Cal.

I herewith submit the following as a full and true statement of my *quantity* and *quality* test of illuminating gas, manufactured by me at the works of the New York Gas-light and Heat Company, No. 211 Mercer street, city of New York, on the 9th, 10th, and 11th of April, to wit: As a prerequisite, the works and workmen were placed under my entire charge, and no orders whatever were given in any way during the period of said test, except by me. On the morning of Tuesday, 9th inst., I directed the workmen to weigh fourteen hundred pounds (1,400 lbs.) of coal from the gas company's coal. The scales having been carefully tested and adjusted, said coal being very *fine* and *wet*, having been procured from one of the coal yards of the city, and of very inferior *appearance* it was then divided and charged in the four iron retorts, and the state of the station meter taken and its record of the amount carefully noted. The above amounts of coal were divided into two three hundred and two four hundred charges, and placed in the retorts as follows; first 400 pounds, at 9 a. m.; first 300 pounds at 9½ a. m.; the second 400 pounds at 11 a. m.; and the second 300 pounds at 12½ p. m. The superheated steam was turned on at 11 a. m., and turned off at 5½ p. m. The meter was noted nine times during the burning off of the charge. Commencement of test it stood 205,060 cubic feet; at close it recorded 211,470 cubic feet, showing a production of 6,410 cubic feet =4.27 cubic feet per pound coal. At 6 p. m. same day, weighed out fourteen hundred pounds of coal from two hogsheads, sent from Philadelphia by me, and which contained coal from the mines of Westmoreland county, of Pennsylvania, being the quality of coal used at the works of the Philadelphia Gas Trust. Divided the above weight of coal as before, and charged the same four retorts as follows: first 400 pounds at 6 p. m.; first 300 pounds at 7 p. m.; second 300 pounds at 8½ p. m.; second 400 pounds at 10.20 p. m. The station meter recorded 211,470 cubic feet at commencement of charging, and recorded 220,750 cubic feet at close of test, showing a production of 9.280 cubic feet=6.62 cubic feet per pound. The superheated steam was turned on at 8 p. m., and turned off at 4 a. m.

As an important item in connection with these tests, it is proper to state that owing to the defective counter-weighing of the gasholders (telescopic), there is a great variation of pressure under which the gas is registered, *and was during* these tests; for instance—the average pressure under which the gas was measured during the day or first test, equalled four inches water pressure. The average pressure on the meter during the manufacturing of 5,000 feet of test No. 2, was about 1¾ inch, and during the balance of that test averaged 4 inches. The *cause* for variation in pressure between day and night is occasioned by the use or consumption of the gas from the holders by the Grand Central Hotel, between the hours of 6 p. m. and 12 midnight, the time of their principal consumption—which equals about 15,000 cubic feet during *that time;* after 12 midnight, the pressure rapidly increases again from the average of 1¾ inch during said consumption to 4 inches.

On the morning of April 10th, Wednesday, the balance of coal remaining in the hogsheads was weighed, viz.: thirteen hundred and ninety-five pounds (1395 lbs.), making a total of twenty-seven hundred and ninety-five pounds from the two hogsheads. Having procured twenty-eight hundred pounds, it shows a loss of five pounds in transportation from Philadelphia, or difference in weights. This amount, 1395 pounds of coal, was divided as before between the said four retorts, viz.: first 300 pounds at 8½ a. m.; second 300 pounds at 9½ a. m.; first 400 pounds at 11 a. m.; and the balance 395 pounds, at 12.20 p. m. The station meter recorded 220,750 cubic feet at commencement of test, and recorded 228,390 cubic feet at close of same, showing a production of 7640 cubic feet=5.47 cubic feet per pound. The average pressure during the test was nearly five inches; and, during a portion of the test, the gas was measured under a pressure of over 5½ inches. The upper section of one of the holders having cupped the lower section and raised it several feet. During this test the superheated steam was used six hours.

On the evening of the above day, Wednesday, fourteen hundred pounds of the gas company's coal was again weighed out, and divided as before, and charged between the same retorts. First 300 pounds at 8½ p. m.; second 300 pounds at 9 p. m.; first 400 pounds at 9.45 p. m.; and the second 400 pounds at 10.20 p. m. The station meter recorded at commencement 228,390 cubic feet, and at close of test 236,320 cubic feet, showing a production of 7930=5.66 cubic feet per pound. The pressure during this test was about 2 inches for four hours, 3 inches for one and a half hours, and averaged 4 inches during the balance of the test.

The amount of coke produced from the Westmoreland coal was 24 barrels, weighing an average of 92 pounds per barrel, or 2208 pounds coke.

The average results of the tests of quality gave a candle power of 21.66 candles=five cubic feet of gas

consumed in one hour and 120 sperm grains per candle. The number of tests were twelve, of which the above is the average.

The temperature used in these tests as near as could be judged=about 900° for the iron retorts, and from 2,100° to 2,500° for the clay retorts.

ANALYSIS OF THE TESTS.

Day test, company's coal, produced as follows:

Day test, 1,400 pounds produced 6,410 cub. ft.; average 4.50 feet per pound=10,255 cub. ft. per ton.
Night test, 1,400 pounds produced 7,930 cubic feet; average 5.66 feet per pound=12,687 c. ft. per ton.
Total, 2,800 pounds produced 14,340 cub. ft.; average 5.12 feet per pound=11,471 cub. ft. per ton.

WESTMORELAND COUNTY COAL.

Day test, 1,400 pounds produced 7,640 cub. ft.; average 5.48 feet per pound=12,266 cub. ft. per ton.
Night test, 1,395 pounds produced 9,280 cub. ft.; aver. age 6.63 feet per pound=14,846 cub. ft. per ton.
Total, 2,795 pounds produced 16,920 cub. ft.; average 6.05 feet per pound=13,556 cub. ft. per ton, or
Total result, 5,597 pounds produced 31,260 cub. ft.; average 5.59 feet per pound, 12,513 feet per ton.

Compared with the production of gas by the *ordinary* process, the result would stand thus: Average production of gas from one pound of Westmoreland county coal in one of the principal works in this country using entirely that coal=4¼ ft. or 9,520 ft. per ton.

Westmoreland coal, Elmer process, day test.....	"	12,266	" "
Westmoreland coal, ordinary process.....	"	9,520	" "
Increase,		2,746	" "
=28.84 per cent.			
Westmoreland coal, Elmer process, night test.....	"	14,846	" "
Westmoreland coal, ordinary process.....	"	9,520	" "
Increase,		5,326	" "
=55.95 per cent. or,			
Westmoreland coal, Elmer process, *night* and *day*...	"	13,556	" "
Westmoreland coal, ordinary process.....	"	9,520	" "
Increase,		4,036	" "
=42.31 per cent.			

Elmer process, total, Westmoreland and unknown coal, over the ordinary process, viz:

Elmer.....	12,513 feet per ton.	
Ordinary process.....	9,520	" "
Increase,	2,993	" "
=31.43 per cent.		

The works have been constructed in an unfortunate manner, so far as *pressure* is concerned. The gasholders, two in number, being 20 feet by 47 feet *high* when both sections are up, and not being properly counter-weighted, give an undue pressure. It must, therefore, be apparent to those familiar with the subject, that this excessive pressure was greatly against producing the most favorable results, as will be seen by observation of day and night tests in *both coals*.

In conclusion I must say that every facility was afforded me to inspect the works, and examine everything connected therewith, during the test and at all other times, day or night; and the placing of the works in my charge gave me all the opportunities I could desire to examine them. I would further state that I remained in the works during almost the entire period of the tests, viz, two days and nights. The entire amount of sleep in the sixty-six hours I was engaged in the tests and calculations, amounting to about nine hours. I make this statement in order that those interested may see the impossibility of *fraud* having been practised upon me, by the introduction of any foreign substance other than the coal and superheated steam. All of which is respectfully submitted, without comment, as *facts* are the strongest of arguments. WM. WALLACE GOODWIN.

To the above statement is appended a *sworn affidavit* of all the operatives employed during the time, six in number, from which we make the following extract:

"We further state that we were entirely under the direction of Mr. W. W. Goodwin during the above two days and nights, and that no person whatever had anything whatever to do with the works or any apparatus connected therewith, except ourselves and Mr. Goodwin; and we further state that nothing whatever, other than the above named coal, was introduced into the retorts, or any part of the apparatus, during the above named two days, except the superheated steam. And we further state that *nothing whatever* was introduced into any part of the apparatus *preparatory* to Mr. W. W. Goodwin making the test; and that whatever merit may have arisen from said test or shows itself in the use of the process as used in this works, over the usual process used in gas works, generally, we do honestly believe to arise simply from the manner in which the coal is treated in the Elmer process; and we further state that we, the firemen, are familiar with the mode of manufacturing gas by the ordinary process, having been employed in gas works for several years. To all the above we do most solemnly swear, as being the whole truth, and without any *mental* reservation whatever, so help us God."

[Sworn to before notary and signed by all.]

Also the following, from the proprietor of the Grand Central Hotel:

"GRAND CENTRAL HOTEL,
"Private Office, New York, April 23rd, 1872.

"This is to certify that I commenced using the gas manufactured by the New York Gas-Light and Heat Company, No. 211 Mercer street, in the Grand Central Hotel, New York, in the month of November, 1871, and have continued to use the same from that time to the present date.

"The consumption in the Grand Central is about 20,000 cubic feet every 24 hours, and the number of burners about 3,000. The *quality* of gas furnished by the above company is *much superior in every respect* to the gas furnished by the other companies of this city. H. L. POWERS."

Mr. Goodwin gives also, in an appendix, detailed statements of the minute observations made personally by him, during the whole progress of each of his tests, one of which only we make room for, and that in a condensed form, our object being to show what extreme care was exercised by him, to avoid the possibility of any deception or jugglery.

Second Test, with Westmoreland Coal.	Time.	State of Meter.	Time per 100 ft. Average.
First Charge.			
400 lbs. at 6 P. M.	6. P. M.	211.470	
Second Charge.			
300 lbs. at 7 P. M.	7.20 "	212.360	100 ft. in 8.98 m
Third Charge.			
300 lbs. at 8½ P. M.	8. "	212.810	100 " 8.88 m
Fourth Charge.			
400 lbs. at 10.20 P. M.	11.45 "	216.060	100 " 6.92 m
	12.12 "	216.460	100 " 6.75 m
	12.20 "	216.560	100 " 8. m
	12.27 "	216.660	100 " 7. m
	12.34 "	216.760	100 " 7. m
	1.34 "	217.560	100 " 7.5 m
	1.50 "	217.760	100 " 8. m
	2.20 "	218.160	100 " 7.5 m
	2.29 "	218.260	100 " 9. m
	2.37 "	218.360	100 " 8. m
	2.46 "	218.470	100 " 8.18 m
	3.02 "	218.670	100 " 8. m
	3.20 "	218.870	100 " 9. m
	3.38 "	219.070	100 " 9. m
	3.58 "	219.270	100 " 10. m
	4.19 "	219.470	100 " 10.5 m
	4.30 "	219.570	100 " 11. m
	4.44 "	219.670	100 " 14. m
	4.56 "	219.770	100 " 12. m
	Omitted.	219.950	
	5.20 A. M.	219.970	100 " 12. m
	5.25 "	220 000	100 " 16.66 m
	7. "	220.530	100 " 17.92 m
	8.30 "	220.750	100 " 40.9 m

On the History and Manufacture of Petroleum Products.

A Memoir, communicated to the Society of Arts, Massachusetts Institute of Technology, March 14, 1872.

By S. DANA HAYES.
State Assayer and Chemist for Massachusetts, Etc.

[Communicated to this Journal by the Author.]

[Concluded from page 138.]

Four of these products are especially interesting and valuable; the first is

RIGHOLENE.

It nearly corresponds to the keroselene of the Albertite products, and is an extremely volatile hydrocarbon, used for producing local anæsthesia, by its rapid evaporation, during short surgical operations. In 1866, Mr. Merrill was requested to make the most volatile fluid he could produce from petroleum, by Dr. Henry J. Bigelow, the eminent surgeon of Boston. This was done by redistilling gasolene, which was the very lightest petroleum naphtha, by steam heat, and condensing the first distillate by the aid of ice and salt. In this way, ten per cent of the gasolene was converted into the lightest of all known fluids, which was named righolene by Dr. Bigelow. Its specific gravity is only .625, and it boils at 65 deg. Fahrenheit. The evaporation of this fluid is so rapid at common temperatures, that it will depress the mercury in a Fahrenheit thermometer to 19 deg. below zero, in 20 seconds. Several hundred gallons of righolene have been consumed for surgical purposes. We pass next to the

NEUTRAL HEAVY LUBRICATING OIL.

At the works in South Boston, the production of lubricating oils has always been a specialty, but with petroleum there came a scarcity of heavy and dense crude materials from which to make these oils; fortunately however, other manufacturers of petroleum, finding the illuminating oil and light products more profitable, have been glad to dispose of their heavy residuum at these works; and the deficiency of material has been supplied from this source.

The lubricating or paraffine oils were always characterized by offensive odors and tastes, so that a person brought in contact with them became at once aware of their origin; and the desideratum with manufacturing chemists, from the earliest days of this industry, has been the production of dense *neutral* oils, or oils free from these offensive objections. Much time and study have been devoted to experiments having this object in view; and shallow stills, stills with double heads, repeated distillations, different processes of purification by chemical agents, and many other means, have been tried without success. But, partly as the result of an accident, Mr. Joshua Merrill succeeded in making neutral oils in November, 1867.

Distillation had fairly commenced, from a still heated in the usual manner, by a direct fire underneath, and charged with 900 gallons of mixed heavy and light oils that had been previously distilled, and which were too heavy for illuminating, and too light for lubricating purposes, when it was found that the condenser had partially closed from some accidental cause; and this, by the consequent pressure, soon caused leakage at joints about the bottom of the still, over the fire. Continued distillation increased the leakage, so that it was necessary to withdraw the fire gradually from under the still; although the distillation was continued for some time in an attempt to empty the apparatus by operating very slowly. When the fire was removed, and after distillation ceased, 250 gallons of light hydrocarbons had passed over through the condenser. The next day, the oil left in the still, having cooled sufficiently, was removed; and Mr. Merrill was surprised to find it different from anything that he had ever seen before. It had a bright yellow color; was clear, very nearly odorless, *neutral*, and dense. Further experiments showed this result to have been obtained by the *removal of all light odorous hydrocarbons without decomposing* either the distillate, or the oils remaining in the still; and that this had been accomplished by the moderate fire employed, and its gradual withdrawal.

This mode of operating was immediately applied to other distillations; and, after two months spent in determining the best mode of procedure, Mr. Merrill obtained letters-patent for his valuable discovery, from which extracts will be made in a description of the present improved processes of manufacturing petroleum products, at the end of this memoir. This discovery consisted, first, in determining that the odor and taste of the heavy distilled oils arise from the presence in them of light and odorous hydrocarbons, formed during the previous and necessarily destructive distillations; and that when these are removed by distilling in a suitable apparatus, with the application of only sufficient heat to remove them, without decomposing or *cracking* the oils in the still, the latter are left nearly odorless. And, secondly, in perfecting the means for effecting this removal of the odorous bodies. The introduction of steam from an open pipe to the body of the apparatus during this distillation, aids greatly in effecting the separation, as it lifts the light vapors out mechanically into the condenser; and it also serves to regulate the heat employed for distillation.

Thus, by extraordinary means, true fractional distillation of the heavy mixed oils is effected; and Mr. Merrill says, "I believe it is impossible to prevent the cracking or decomposition of these hydrocarbon oils, except by keeping them in the still, at temperatures below their boiling-points."

Many hundred thousand gallons of this neutral heavy hydrocarbon oil, which has frequently perplexed the most expert judges and dealers in oils, have been made by Mr. Merrill. It is almost odorless and tasteless, and cannot be easily distinguished when mixed with one-fifth part of its volume of the best bleached animal sperm or other fat oil, as an examination of this specimen will assure you. No better estimate of its valuable qualities can be given than the statement,

that, in the year 1871, 50,000 gallons of this oil were sent to England alone, where it was used for lubricating spindles, oiling wool, and other purposes. Another important substance obtained from petroleum is

PARAFFINE.

This was one of the very first products made at the works in South Boston, in the early days; and it is interesting to know, that while Cuban chapapote bitumen yielded paraffine by distillation, and Albertite gave large quantities of it, the Trinidad bitumen never afforded any of this crystalline mineral wax. Mr. Merrill began to make paraffine from Pennsylvania petroleum in 1859, and since then has, at times, made the enormous quantity of 50,000 pounds (or 25 tons) in one month. It is a product of *destructive* distillation of this petroleum, and does not exist already formed in the crude oil.

This substance is used principally in candles, also for rendering textile fabrics water-proof, and for many other purposes; as one maker of friction-matches in New York has used 100,000 pounds, and a manufacturer of chewing-gum in Maine 70,000 pounds, of paraffine, in one year. The fourth product to which I wish to draw your attention is

MINERAL SPERM OIL.

This is a burning heavy oil made from petroleum; and its valuable properties as a safe illuminating agent are such as to render this product one of very great importance. The following statement of its discovery and characters is given in Mr. Joshua Merrill's own words:

"In the summer of 1869, in connection with Mr. Rufus S. Merrill, I made an important discovery relating to burning the heavy or paraffine oils in lamps, for illuminating purposes. Mr. R. S. Merrill is a skilful mechanic, who has devoted himself for several years to perfecting the construction of lamps and burners for hydrocarbon oils. While experimenting upon an apparatus for burning paraffine wax, with a view to increase the light from this beautiful substance over that obtained from common candles—the only form in which paraffine is burned—he one day put some lubricating oil into the lamp, instead of the paraffine wax, and we were both much surprised at the good qualities of the light yielded by it. But, after experimenting some days, we found this heavy oil to be impracticable as an illuminating material in its present form, and that some modification would be necessary. It occurred to me, that if this heavy paraffine oil was passed through a partially destructive distillation, cracking it enough to lessen its viscidity, but not enough to render it volatile, its increased mobility would cause it to ascend the wicks freely, and yet preserve its characters as a fixed oil.

"After many trials, I obtained the product now called 'mineral sperm oil,' which is sufficiently thin to fill the wicks perfectly; but it is so far from being a volatile oil, that it is comparatively inodorous, and will not take fire at any temperature below 300 deg. Fah., or nearly 100 deg. hotter than boiling water. Flames of considerable size, such as a large ball of wicking-yarn, saturated with oil, and ignited, when plunged beneath the surface of this oil, previously heated to the temperature of boiling water, are extinguished at once. It burns freely in the German student-lamps, and with great brilliancy from the 'Dual' burner."

The manufacture of this oil is patented in this country and in Great Britain; and Mr. Merrill estimates the quantity that may be made as at least one-quarter of the whole production of petroleum, or 160,000 gallons of the mineral sperm oil every day—a quantity more than twice that of the whale and sperm oils, obtained in the best days of the whale-fishery of this country.

The present time, when government authorities and scientific men are so generally cautioning against the "dangers of kerosene," and just as French savans have discovered that certain heavy petroleum oils may be burned in lamps,* seems peculiarly opportune for the introduction of this product of American skill and invention—namely, a hydrocarbon, or mixture of hydrocarbons, which seems to fulfil all the requirements of an oil to be burned in lamps, yielding a steady, brilliant, and safe light. And practical indications of its appreciation may be found in the manufacturer's announcement, that the demands for this mineral sperm oil are steadily increasing. It is used on ocean steamers plying between the United States and Europe, and also on several railroads.

It only remains for me to give you a brief outline of

THE MANUFACTURE OF PETROLEUM PRODUCTS,

as conducted at a well-managed establishment in this vicinity.

The crude petroleum is received here from the West in round wooden tanks, one or two of which occupy a railway carriage, as you have undoubtedly observed them on the neighboring railroad; and these are some imes emptied into bulk boats, when the works are more easily approached by water. The petroleum is pumped out and under ground into iron reservoir tanks that closely resemble gasometers, where any sand and water that may be present are deposited and removed. The crude oil drawn from these reservoirs, is first pumped into large wrought-iron stills or upright cylinders, incased in wood to prevent loss of heat, which hold about 12,000 gallons each. These are the naphtha stills, in which the petroleum is heated by steam alone; the distillates being collected by condensers, consisting of iron pipes surrounded with cold water. Only the naphthas, or about 15 per cent of the crude oil, are distilled from these large stills; but the four kinds (gasolene, A, B, and C naphtha) are collected in different receptacles. Rigolene, as stated before, is made by a second distillation of gasolene.

The steamed crude oil remaining in the naphtha stills, is pumped from them into smaller stills heated by direct fires underneath, and holding about 1000 gallons each; the whole contents of these are distilled over, and condensed, excepting that which passes into the air as uncondensable gas, and the separated carbon. This is the first complete distillation and it is eminently *destructive;* the products being separated, by densities, into three grades: No. 1, crude burning oil; No. 2, intermediate oils, and No. 3, crude lubricating oil. Each of these is redistilled by itself in apparatus of the same size and construction as that used for the first distillation, and they all break up again into lighter, intermediate, and heavy oils. No. 1 is thoroughly agitated with sulphuric acid and caustic soda successively, by revolving stirrers in large tanks, before its second distillation; and it then yields, from the still, 80 per cent of its volume of finished kerosene and mineral sperm, and nearly 20 per cent of denser oils. No. 2 is redistilled before treatment with acid and alkali; it yields crude lubricating oil principally. No. 3, the crude lubricating oil, requires more careful manipulation than either of the others. It is first agitated with sulphuric acid, and then distilled with caustic soda present in the still, the product being mostly dense paraffine oil. This is placed in wooden barrels, in ice-houses, where it remains for from seven to ten days; and, during this time the paraffine wax crystallizes, so that the masses retain the form of the barrels when they are removed. It is now put into bags made of strong cloth, which are arranged one above another, with sheets of iron between them; and, when submitted to heavy pressure, it yields crude scale-paraffine wax remaining in the bags, and heavy oil is pressed out. The crude paraffine is refined by repeated solution in naphtha, recrystallizing, and pressing until it is perfectly white and pure, ready for sale. The heavy oil is treated by the patent deodorizing process. It is placed in stills heated by fires underneath; and the temperature is slowly and gradually raised, until from 20 to 30 per cent of the contents of the apparatus is distilled over; it is then allowed to cool in the stills, and when removed, is ready for sale. The hydrocarbons that pass over to the condensers during this process have very offensive odors; but the oil remaining in the stills, if the operation has been properly conducted, is free from the characteristic odor of paraffine oil, and has only a slight odor similar to that of fat oils. Live steam is generally used in the body of the oil during this operation, and the distillation is effected at as low a temperature as possible,

The very last distillates that are obtained from all the destructive distillations made at the works are highly colored, and known technically as "cokings": these are accumulated and distilled by themselves, yielding crude lubricating oil principally. After every distillation of petroleum, or the products obtained from it, considerable masses of separated carbon are obtained as residua; and as caustic soda is frequently used in the apparatus, it remains in this coke; this is saved, however, by burning the carbon in a properly-constructed fireplace; and the ashes lixiviated yield the soda as carbonate. The sulphuric acid that has been agitated with the oils, known technically as "sludge," is carefully saved, and generally sold to the makers of biphosphate of lime fertilizers; although some of it has been successfully reconverted into commercial oil of vitriol, by an ingenious process, that I need not detain you to describe.

I have thus hastily reviewed the history and *modus operandi* of an important manufacture, in the belief that some parts of this memoir are new, and of general interest.

* Comptes Rendus de l'Acad. de Sciences, July, 1871.

The Brooklyn Park.

Work is progressing in the Prospect Park, Brooklyn, N. Y. Already eight miles of walks are completed, and from twelve to fourteen miles of drain and water pipes have been laid, and a new bridge of *beton coignet* is nearly completed. The large lake, containing some fifty-four acres, and which was barely completed at the close of the last season, is now being filled with water, for which purpose the pump in the large well is at work constantly, pumping at the rate of 700,000 gallons in twenty-four hours. The quantity of water which will be daily required during warm weather to keep a pond of this size at a uniform level to offset evaporation alone will be something like 400,000 gallons. In addition to this amount, which will be substantially a constant quantity during the months of May (in part), June, July, August, and September, the puddling of the lake, from the nature of the material, is not entirely impermeable, and the consequent infiltration will require a considerable additional supply to make good this deficiency, which will, of course, decrease as the bottom "tightens."

The operations of this great well at the Park are not uninteresting. A constant flow of water is being pumped through the water-courses into the lake, and is the water from the drainage of the southern slope of this locality, intercepted at a level of thirteen and a half feet (mean high tide being the datum plan) on its way to the sea. This well substantially supplies all the water required on the Park for useful and ornamental purposes.

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—Ed.

The Louisville Meter Case.

Louisville, Ky., May 7, 1872.

Mr. Editor: As many enquiries have been lately made, allow me as a matter of general interest to say, through your valuable Journal, that the testimony in the case of George F. Fuller vs. the Louisville Gas Company, was accurately reported by an authorized and properly qualified person. This company had a limited number of copies printed at the time for their own use, but knowing that it would be a valuable addition to the gas literature of the day, had the whole matter stereotyped, and have made such arrangements as will enable gas companies or others to procure in future any number of copies that they may desire, at fifty cents each. The undersigned will very cheerfully attend to all orders for the book, etc.

Respectfully yours,

Benjamin Rankin.

Practical Suggestions on Candle Power.

Newark, N. J., April 29, 1872.

Mr. Editor: Below please find some calculations that may prove interesting and instructive to the readers of your valuable Journal. They are taken from a table of comparative values of certain coals, oils, etc., that I have prepared for my own use. Among other things it shows conclusively the great error made in introducing air into any gas to increase its volume.

The deductions are made from the following premises:

I. That the value of any coal or enricher is determined by its equivalent in pounds of sperm.

II. That from the first cost of a ton of coal should be deducted the value of its residual products, to arrive at its first cost. As it is not necessary to carbonize a ton of coal by the coke produced from it; it being possible to use anthracite, wood, etc., and in some cases it might be economical to do so.

III. That the quantity of fuel necessary to carbonize a ton of coal is about the same, not varying sufficiently to largely affect a calculation of this kind. It being well known, however, that the more rapid the production and the greater the yield of any coal, the quicker do we feel a reduction in the temperature of the retorts.

Speaking more practically; if we take two benches equally heated, and charge in the one 1,200 pounds of Penn coal, and, in the other 1,200 pounds of Albertite, the bench charged with Albertite would lose its temperature much before the other; the reason being that a greater quantity of gas would be evolved, and

that a greater amount of heat would be rendered latent and absorbed by the nascent gas.

Table showing values of certain coals, etc. :

(a) Penn Coal, 1 Ton=	9,500 ft.	of 17.00 c.	gas=	554 lbs.	sperm.
a) Ritchie	" =15,000	" 20.	"	=1543	"
(b) Wollongong	" =18,716	" 132.94	"	=6251	"
(c) Naphtha	" =28,000	" 100.	"	=9600	"
(c) N. G. 53 p.c.) Air 47 p.c.	=56,000	" 20	"	=3840	"

The actual cost of the coals, etc., is as follows :

Allowing ten cents per bushel for the coke, and, giving the Penn coal 40 bushels, the Ritchie 20, and none to the Wollongong or Naphtha.

Coals, etc.	First Cost per Ton.	Less Coke.	Actual Cost per Ton.	Costof a lb of sperm in cents and mills.
Penn.....	$6 87	$4.00	$2.87	.0518
Grahamite..	16.00	2.00	14.00	.0907
Wollongong	30.00	0	30.00	.0417
Naphtha....	39.20	0	39.20	.0408
Naph. & air.	39.20	0	39.20	.1020

From this it is seen that Wollongong cannel at $30 per ton, produces its sperm equivalent cheaper than the Penn coal at 6.87 ; or, by a simple calculation, that the sperm equivalent of the naphtha and air mixture costs as much—at ten cents per gallon for the naphtha—as that of that of the Penn coal, at $10 per ton. A profile that I have made showing the rise and fall in the cost of the sperm equivalent, dependent on the price of the coals, is very interesting and useful.

Yours respectfully, X.

(a) (a) These are the accepted values of these well-known coals.

(b) Taken from the valuable report of B. Silliman and H. Wurtz, on the Hydrocarbon Gas process, p. 45.

(c) (c) Experiments made at Saratoga and elsewhere—Naphtha being taken of a specific gravity of .700, temperature 60° ; thus giving 392 gallons to the ton.

The Buffalo Gas-Light Company.

The annual meeting of the above company was held at its office yesterday (May 7th). The resolutions of respect to the memory of Samuel F. Pratt, Esq., late president of the Board, adopted by the Board May 2d, 1872, was read and unanimously approved.

ELECTION OF OFFICERS

The following gentlemen were elected directors for the ensuing year : Eldridge G. Spaulding, Oliver G. Steele, Gibson T. Williams, George Howard, Pascal P. Pratt, Ethan H. Howard, William Bucknell.

At a subsequent meeting of the Board, Hon. E. G. Spalding was elected president and treasurer, and O. G. Steele, Esq. secretary.

THE DIRECTORS AND THE LATE SAMUEL F. PRATT.

At a regular meeting of the directors of the Buffalo Gas-Light Company, held at its office May 2, 1372, the following preamble and resolutions were submitted :

Whereas, The members of this Board have learned with profound regret, that the long and painful illness of its president, Samuel F. Pratt, terminated in his death on Sunday morning, April 28. It is therefore

Resolved, That the death of Mr. Pratt falls with peculiar grief upon this Board, over which he has presided since its organization in 1848, with the dignity and uprightness of purpose, which was so marked in his character.

Resolved, That the firm, liberal and conscientious manner in which he has presided over the progress and policy of this company has commanded the confidence and respect of all with whom it has had transactions, and has always been inspired by strict justice and integrity to itself, and to the public, under all circumstances.

Resolved, That the removal of Mr. Pratt from among us has created a void, which will long be felt by the surviving members of this Board, as well as by the community among whom he has been a life long resident, and his memory will be cherished by all who have known him, with deep reverence for his pure, unselfish, and eminently Christian character.

Resolved, That this expression of respect be entered upon the records of this company, and that a copy be transmitted to the bereaved family of the deceased.

Adopted unanimously.

TRIBUTE OF THE EMPLOYEES OF THE GAS COMPANY.

At a meeting of the employees of the Buffalo Gas Company, held on the 28th ult., the following preamble and resolutions were unanimously adopted :

Whereas, It has pleased an all wise Providence to remove from our midst our late worthy and esteemed president and treasurer, Samuel F. Pratt, and

Whereas, The intimate relations long held between us renders it proper that we express our appreciation of the many kindnesses extended to us, however humble our position, therefore,

Resolved, That we deeply deplore the loss of Mr. Pratt, and that in his death we feel that we have lost a kind adviser, a true friend and benefactor.

Resolved, That we tender to his afflicted family our sincere condolence and earnest sympathy in their affliction in this great bereavement.

Resolved, That a copy of the foregoing resolution be transmitted to the family of the deceased, and the same be published in the daily papers of this city.

Signed by 84 employees.

—*Buffalo Courier, May 8.*

The Weather-Waste of Coal.

Dr. Varrentrapp has made this the subject of an investigation, and as a result states that the amount of loss suffered by coal from exposure to weather is considerable, far greater, indeed, than is generally known.

The results of his analyses show in some cases a total loss in weight of a specimen, from this cause, amounting to 33·08 per cent, while its deterioration in quality for purposes of fuel or gas-making reached a still higher figure.

This change consists in a slow combustion, in which the volatile constituents—which are most valuable combustible elements—are gradually eliminated, while the relative proportions of carbon, ash and sulphur are comparatively augmented. It might be expected, now that the nature of this change is indicated, that anthracite (which has already gone through a very similar process in becoming what it is, by the loss of its bituminous matter) should suffer least of al coals from this action, and the result of analysis shows this to be the case. The density and compactness of this variety, aside from its chemical character, protect it in no inconsiderable degree. The Cannel coals rank next in their power to resist deterioration from this source ; while the bituminous varieties are the most susceptible.

The experiments of Dr. Varrentrapp are of such direct and practical importance that all who are engaged in the mining, transportation, storage or consumption of coal can study them with profit. It appears, from accurate tests of a number of samples before and after exposure, that all the valuable properties of the coal had deteriorated.

The coking quality of the weathered coal diminishes with its gas-yielding quality, the author informing us that a sample of coal yielding, when freshly mined, a firm coherent coke, after eleven days' exposure, yielded a coke of no coherence, and in all the samples tested the rule was absolute that the longer the coal had been exposed the greater was the inferiority in the quality of the coke it produced.

The gas-yielding quality decreased in one instance 45 per cent, and the heating power 47 per cent ; while the same sample under cover lost in the same time but 24 per cent, for gas purposes, and 12 per cent. for fuel. These experiments go far to explain the almost universal inferiority of the slack or waste coals in heating power when prepared for burning, even though some combustible material like pitch or tar is used in their cementation. It indicates, too, the imperative necessity of keeping coals amply protected from the deteriorating action of the air and moisture by keeping them constantly dry and under cover.—*Journal Franklin Institute.*

The Gorman Gas-Furnace.

Mr. Gorman's heat-restoring gas-furnace was first constructed at the Govan Bar Iron Works, in the year 1864, since which time it has received the patentee's constant attention. In developing his patent, Mr. Gorman's great aim was to economize fuel by restoring part of the heat which escapes in ordinary furnaces. In practice it was found that the arrangements necessary for this purpose were also admirably adapted for consuming the volatile gases of coal, thereby increasing economy and preventing smoke. As is well known, the coke, or solid part of the coal, is completely burnt on the grate of the ordinary furnace, and the combustion of the gaseous part of the coal thus prevented. In the heat-restoring gas-furnace, however, the solid part of the coal is converted into carbonic oxide gas, which is combustible, and which along with the coal is burnt with a further supply of air on the part of the furnace where the heat is wanted. The gas furnace has been successfully applied in re-heating for bar and plate mills, in puddling, in welding scrap, and for all ship-building purposes. So general has its use become in the neighborhood of Glasgow that we find it used for boiler makers, bridge builders, and rivet and nail makers, while it is also successfully applied by the Coatbridge Tin-Plate Company for enameling and annealing.

The use of the Gorman furnace being so general it must, one would think, have very conspicuous and definite advantages over the ordinary reverberatory furnace. The principle of action, to begin with, is entirely different. It is heated by combustible gases, which may be supplied from any suitable source. The gas used for illuminating towns, or the gases escaping from blast furnaces, will answer the purpose admirably. It is not essential that the gas should be produced in connection with the furnace, although hitherto it has been produced in the apparatus attached from the ordinary coal or slack procured in the neighborhood of Glasgow. The gas producer occupies the same place as the grate-room in ordinary furnaces, the only difference being that it is deeper, to allow at all times a thickness of over two feet of fuel on the grate bars. This provision is necessary to prevent carbonic acid from rising among the combustible gases. The proper working of the producer has hitherto been either little understood or greatly neglected, and hence a great impediment has been thrown in the way of the legitimate results which, under proper management, the furnace will unfailingly yield. The conditions laid down by the patentee are—keep the bars clean, taking out clinkers, but no coke or charred coal that can be avoided ; fire often, and keep the fuel up level with the firing door, or higher, at all times, but do not put too much on at a time.

To transfer the heat from the waste products leaving the furnace to the air entering the furnace for combustion, an apparatus called a heat-restorer is employed. This instrument consists of two tubes, the inlet of one tube adjoining the outlet of the other. The tubes are open at both ends, and they are so constructed that if hot water be poured in one tube, and cold water in the other, the hot water will run out cold, and the cold water will leave the instrument heated very nearly to the temperature of water which was poured in hot. In the same manner the restorer transfers the waste heat to the air for combustion. The restorer is a chamber placed usually under the ground line, and into which is placed a number of fire-clay pipes, open at both ends. At each end of the pipes a wall runs up, and divides the chamber into three compartments. The flame or waste heat from the furnace passes downwards through the centre compartment, impinging on the outside of the tubes placed therein ; and the air for combustion, entering the end space at the bottom, passes through the pipes to the other end, from which it rises to a higher series of tubes, and re-crosses until it arrives at the top of the chamber. An upward current of air thus meets a downward current of heated gases, with only the thickness of the fire-clay tube between them, the current of air inside preventing the destruction of the tube by the high temperature outside.—*Lond. Mining Jour-*

[Original Communication.]

The New Lake Superior Tin-Region.

By Prof. Henry Wurtz.

At the meeting of the New York Lyceum of Natural History, April 29th, Prof. Henry Wurtz exhibited some beautifully crystallized specimens of heavy tin-stone or cassiterite, discovered a few months since on the most northerly shore of Lake Superior, near Neepigon Bay. The parties who brought them say they were shown a line of boulders, strung through a ravine from near the lake shore for a long distance inland. "This float is in large irregular masses, made up almost entirely of a very heavy mineral resembling hematite iron ore, and strewn over the surface in quantity."

[*For continuation see page* 162.]

THE AMERICAN

GAS-LIGHT JOURNAL

AND

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☞ All communications to be addressed to "THE EDITOR, No. 42 Pine Street, Room 18, New York.

THURSDAY, MAY 16, 1872.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS*, or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

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CONTENTS.

☞ An asterisk (*) denotes an illustrated article.

Springfield Gas Machine*.....153
Artesian Wells on the Western Plains.....153
Chemical Excerpts.....154
Report on Sulphur-Purification at the Beckton Gas Works, by the Gas Referees.....155
Report Upon the Grand Central Hotel Gas.....156
On the History and Manufacture of Petroleum.....157
The Brooklyn Park.....158
CORRESPONDENCE.—
The Louisville Meter Case.....158
Practical Suggestions on Candle Power.....158
The Buffalo Gas Light Company.....159
The Weather Waste of Coal.....159
The Gorman Gas Furnace.....159
The New Lake Superior Tin Region.....159
EDITORIALS—
The Gas at the Grand Central.....160
The Sulphur Report of the Referees.....161
Fire Damp from Anthracite.....161
A Caution.....161
New Lamps for New York.....162

THE NEW GAS AT THE GRAND CENTRAL.

It is now just three months since we brought this subject to the general attention of the Fraternity through our columns. At that time we believed ourselves justified, by reason of assurances received from *attaches* of the "New York Gas-Light and Heat Co.," in announcing that exhaustive investigations of the alleged advantages of the new methods of manufacture would be at once instituted, the complete results of which would have been promptly put by us before the world. Obstacles have occurred, however, such as appear to be usually and inevitably incident to all new undertakings, and it is only in this issue that we are enabled to present a first instalment of exact observations, obtained by dint of the determination and persistence of Wm. Wallace Goodwin Esq., of the well-known firm of Harris, Brother & Co., of Cherry St., Philadelphia. This gentleman, during a recent visit to California, was commissioned by parties there to look into this process, and a perusal of his report, as handed in by him, and printed (slightly abridged) on another page, will show how faithfully and energetically he has fulfilled the duty. Before proceeding to examine some of the points in Mr. Goodwin's Report, let us first reaffirm that the more extended examination promised before is still in contemplation, and in point of fact is now, at the date of our issue, in actual progress; so that facts may be expected soon which will enable every competent man to form his own judgment in this momentous matter.

Now for Mr. Goodwin's results. These were obtained with coal furnished by himself, of a known staple quality, and precautions were taken, such as every reader of the report will concede to have been decisive, to prevent the possibility of any other material finding its way into the retorts or passing through the station meter, other than this Westmoreland coal, as weighed by himself, and its gaseous products. The general result he found was, that, when the conditions were as favorable (in regard to back-pressure, and other circumstances, as could doubtless be maintained constantly, with certain changes in the present construction of the holders) there was obtained 14,850 feet per long ton, or 6.63 feet per lb. of gas which rated over 20 candles. There can be no hesitation in concluding, on the assumption of the absence of all deception or fallacy (which Mr. Goodwin took such laborious pains to exclude), that no such amount of candle-power was ever approached to by any other method applied to this quality of coal. To get from a first quality of Westmoreland, by the ordinary methods of carbonization, 10,000 feet of 16 candle-power, is as much as we ever heard claimed by the most skillful management.

It is to be remembered that the increase of volume here is to be readily accounted for, from the fact that superheated steam, in other words *water-gas*, is made use of; but that there should be, together with the resulting increase of 48.5 per cent. in volume, a *simultaneous* increase of 25 per cent. in sperm value, over and above ordinary Westmoreland gas, is so stupendous that gas engineers will be highly excusable for any amount of incredulity and suspicion. Realizing this, Mr. Goodwin made use of a precaution, in making his observations on the station meter, which, while ingenious enough to deserve notice, appears as if it certainly ought to have led to the detection of any attempted fraud, such, for example, as the introduction of gas or vapor from any other source, before passing the meter. This consisted, as he explained it to us, and as exemplified in the tabular statement with which we close our extracts from his Report, in observing the station meter at short irregular periods of time, noting the time and the status, from which he has reduced, in the last column of the table, uniformly the times corresponding to evolutions of 100 feet. It will be seen that these times increase, as they should, with a very satisfactory and consistent uniformity, which puts out of the question any "hocus pocus" in the way of surreptitious induction of gas from some hidden source. It is to be remarked that Mr. Goodwin's plan of observation, together with the object held in view by him, were kept locked in his own breast until his report was made. It may also be appropriate to add here that in the further tests now in progress, certain further devices, having a like purpose, are to be employed, which will be wholly beyond the control of any but the experimenter himself, and which will furnish a criterion of the genuineness of the gas operated on, still more rigid if possible, than the plan of Mr. Goodwin.

THE SULPHUR REPORT OF THE REFEREES.

In this issue we commence publishing this document, announced in our last. It would appear to have been far from giving satisfaction to the powers that be, in the British metropolis. At a meeting of the "Metropolitan Board of Works," April 12th, a letter was read from Dr. Whitmore, "Medical Officer of Health," reflecting severely on the report, to which we cannot give space; and one Mr. Runtz said, that "for himself, he must say that he never read so ridiculous a report as that made by the gas referees, after taking so long a time for consideration. One would think they did not understand anything about the question. The report gave no information at all; every statement made in it was known beforehand, and every one connected with gas manufacture had gone far beyond the conclusion to which the gas referees had arrived," and so on, and so forth.

"Oh that mine enemy had written a book."

One of the causes of complaint is that the referees, having found the Parliamentary restriction, in the Gas Act of 1860, of 20 grains of sulphur per 100 cubic feet, to be unreasonable and, in the present state of our knowledge, to be impossible of practical fulfillment with certainty; have actually raised the proportion which is to be allowed without incurrence of a penalty, to 30 grains per 100 feet. In view of this, what shall we say of the bill which has been thrust upon our New York State Legislature,* at its current session, by some donkey who demands that the proportion of sulphur in this same volume of gas be brought down to three grains!

Another noteworthy circumstance connected with the reception of this referees' report is, that the gas fraternity in Britain have already (as we some months ago intimated that in our belief they would) found out that the system under which this Board of Referees has been instituted, instead of being inimical to their interests, as they first believed it would be, is, on the contrary, highly serviceable to them. It in fact causes a diversion, by turning the onus of responsibility over to this Board, and making it responsible, in a measure, to indignant gas consumers for the non-performance by the compa-

* Since the above was written, however, this body has broken up, without doing anything, so far as we have been able to learn, in the way of legislation about gas.—ED.

nies of the expected miraculous manufacture of gas of infinite candle-power and fabulous purity, at an infinitesmal cost. Hence no doubt the tears of indignation of Mr. Runtz, as above, and of others of his kidney.

The London *Journal of Gas-Lighting* furnishes a pretty clear index of this change of sentiment on the part of the companies. Though it has put on record the fact that, on application to the secretary of the referees for a copy of this very report, it was contumeliously refused, and had to get one in a roundabout way, yet, instead of abusing the referees, as formerly, without stint, it now "roars you gently as a sucking dove," and is "coming round" rapidly. It "shares the regret that the referees express that their second sulphur report has not been issued at the same time as this"; also—"there is unquestionably much to be learnt on this point (sulphur), and it is only right that the referees should teach us what we want to know. They possess advantages which no experimenters have ever had before, and we naturally look to them for the fullest instruction," etc., etc. Truly the world does revolve; and

"Naught shall endure but mutability."

THE LOUISVILLE METER CASE.

Regarding this now celebrated case, of which a large and important part of the testimony has already been given to our readers (see this Journal for January 16 and February 2, 1872, pp. 18 and 36) a communication will be found in our Correspondence columns to-day, from which we learn that the full report, as printed in the form of a neat pamphlet of 142 pages (for a copy, we return thanks) may now be obtained, to an unlimited extent, by members of the fraternity, on forwarding half a dollar to our correspondent, Benjamin Rankin Esq., Louisville Gas Co.

It may be that we shall be able yet to spare room for some further extracts, but failing this, we advise that all our readers should procure copies, without fail; as this testimony will furnish them the means of demonstrating, in a very conclusive manner, to complainants, that meters, even dry meters, when well made and in order, should be instruments of measurement of a high degree of precision; and may thus possibly lead to an avoidance of litigation in some cases in the future. The two dry meters, on the assumption of the gross inaccuracy of which the suit was brought in this case, by Mr. George F. Fuller, proprietor of the Louisville Opera House, against the Gas Company, were proved, before the Court, by Charles Hermany Esq., Engineer of the Louisville Water Works, by experiments of a most conclusive character, to be correct in their indications to a small fraction of one per cent.

Nevertheless we deem it fitting here to introduce the observation that the dry meter appears to be rapidly losing ground abroad. The following paragraph clipped from a recent exchange, is very significant on this head:

"It is urged against the dry meters that their action is irregular, and that greater uncertainty is inseparable from them than is found with wet meters.

"The Parisian Gas Company has undertaken a series of comparative experiments on both classes of meter. At the conclusion of these trials, which have lasted over several years, the company applied to the municipal authorities of the city definitively to suppress the use of the dry meter.

"This demand has been complied with, and the Prefect of the Seine has recently issued a decree forbidding the employment of dry meters amongst the gas consumers of the city."

We cannot help believing, however, that this conclusion has resulted from no fault in the principle of the dry-meter, but merely from the greater liability of failure in consequence of inferior workmanship, or bad selection of material. Doubtless further practical improvement may be expected, which will render this machine as accurate, reliable, and durable in action as it is elegant in theory and in construction.

FIRE-DAMP FROM ANTHRACITE.

One of the most surprising developments of later times has been the sudden development of "fiery" mines in the Pennsylvania anthracite fields, especially in the most northerly one, known as the Lackawanna or Wyoming basin. It is but a few years since we congratulated ourselves, when reading periodically of the immolation of victims, hundreds at a time, in the British mines, on the supposed fact that we were, and would doubtless continue to be, almost if not quite free from this horror; as our bituminous coal fields have so immense an area superficially that the time appears very remote in the future when it will be necessary, or say profitable (two words which are in fact synonymous, in a "business" point of view) to go down *deep enough* for the development of fiery mines; and as to the anthracite beds, they were universally believed to be free from this drawback.

Our eyes have, however, been sadly opened of late, and a new case reported (March 11), in which three engineers surveying a suspended mine near Wilkesbarre were instantly killed, and a fourth narrowly escaped, induces us to direct attention to the subject. It is clear that we shall, in the future, have the same experiences to go through as our British cousins, and, unless we take time by the forelock and institute such thorough scientific investigation and devise and *enforce* such wise and efficient laws as have been so much talked about and quarrelled over for half a century in the mother country, we shall soon have similar dreadful catalogues of death to report in our annual statistics.

It is a subject which appeals to the duty and humanity of every citizen, as every one is more or less dependent on the labors of these miners, and the case is therefore one appropriate for the consideration of the general government, rather than of local or state authorities. Let there be then a Scientific Commission created at once, comprising skilled chemists and gas-analysts, to investigate the subject of the safe lighting and ventilation of mines, and the application of the newest discoveries thereto; and let their report be submitted to eminent jurists who shall frame a law, that shall rise to the spirit of the age, in enforcing such management as shall protect this class of our citizens against both the cupidity of employers and the results of their own recklessness.

A CAUTION.

In calling attention to the advertisement headed "Caution," in another column, we are not to be understood as committing this Journal in any way, or as taking any side in the controversy which seems likely to grow out of this business. It would appear that the "American Coal Gas-Light Improvement Co," of Boston claim, and propose to maintain, that the sole right of using and disposing of the use of the improvement now rapidly making its way, of removing or dispensing with the hydraulic seal during the period of carbonization, and restoring it while discharging and recharging, is vested in themselves. The controversy is one of a class with regard to which, *as a Journal*, we ought necessarily, and at all times, to maintain a neutral position; until the tribunals charged by law with the decision of such questions have passed finally thereupon.

Nevertheless, this being a case which we may possibly be justly regarded as somewhat identified with, from our repeated advocacy of the principle of the improvement; it may not be inappropriate to go a little further and state that, so far, the Editor himself occupies, on the question here at issue, the same neutral attitude, not having been called on, by any party, to institute the thorough search throughout the history of the art, which would be necessary to the formation of an opinion. Nevertheless, we consider it the fulfilment of a duty to direct attention to this advertisement, and to recommend to such as purpose adopting the improved method, that it will be well to institute inquiry into these points of priority and proprietorship of the invention or inventions involved.

CAUTION.

SEVERAL CONTRIVANCES HAVING BEEN DEVISED for the purpose of dispensing with the dip-pipe seal, by means of a valve, or cut-off, between the retort and the hydraulic main, in gas works, since this method of making gas was introduced by the AMERICAN COAL GAS LIGHT IMPROVEMENT COMPANY, all of which are infringements upon Letters Patent, numbered 95,459—116,450—and 119,135, owned by said Company. All Gas-Light Companies are cautioned against the use, without license or authority from the undersigned., of said devices.

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Having withdrawn from the firm of R. D. WOOD & Co., the practical management of which we have had since the organization of that firm until June 1871, we have now completed our Works for the manufacture of CAST IRON PIPE and Castings generally.

Having immediate rail and water communication with New York and Philadelphia, as well as the coal and iron regions, we have every advantage of situation.

Our experience in the manufacture of Pipe for a great many years, has enabled us in rebuilding to practically apply Machinery and Fixtures of the very best character, to insure *good work*.

We are now prepared to contract for this class of Castings under the most favorable terms.

We have associated with us Mr. H. G. H. TARR, formerly with R. D. WOOD & Co., who will take charge of our sales department in New York. 262-1y

FILE FOR NEWSPAPERS, ETC.

SUBSCRIBERS DESIRING TO PRESERVE THE AMERICAN GAS LIGHT JOURNAL AND CHEMICAL REPERTORY, can procure a very neat and desirable File or Cover at this office Price $1, postage prepaid.

[*Continued from page* 159.]

About 2,500 pounds of these boulders, together with about 200 pounds of the black ore, which they took out as samples, were lost by the swamping of their boats. They helped to mine, pack, and boat all these ores to Point Aux Pins, and shipped them from there to Marquette by the propeller Cuyahoga, and from there to Detroit per express.

They were told that tons of this ore, in masses of a much larger size than those they saw or took out as specimens, could be found for a long distance inland, but that the vein had not been found in place. This ore was supposed to be iron, and such being the supposition, the parties finding it had not given it that attention they would had they known its true character. From the exceedingly large quantity of "float" on the surface, and its angular, unworn appearance, they felt safe in guaranteeing the early discovery of the vein at a trifling cost.

This tin-stone has been analyzed by Dr. John Torrey, with the following result:

U. S. Assay Office,
New York, December 29, 1871.

W. H. Stephens, Esq.,

Dear Sir: I have assayed the sample of tin ore from the north side of Lake Superior, left with me by H. Pennock, Esq., and report on it as follows:

The ore is a true tin stone or *cassiterite*, mixed with quartz; some of it is massive, but a considerable portion of the specimen examined is in the form of small, translucent quadrangular prisms, some of which are perfectly terminated. The average of the samples yielded 33.3 per cent of metallic tin. It would be easy to concentrate the pulverized mineral to a considerably higher *per centage* of metal.

Yours respectfully,
John Torrey.

We therefore congratulate the American public on the now certain fact of the discovery of an actual tin-bearing district on this continent. "Coming events cast their shadows before," and the numerous bogus reports of tin discoveries that have been in circulation for some years, have been fortunately the precursors of what appears to be a reality.

New Lamps for New York.

The old, dingy street lamps in New York city are being taken down from the main streets, and sent to the repair shop to be renovated and remounted in other places. Convinced that the globe lamp is superior to the older pattern, the city government has just purchased one hundred of them, to be put up on Broadway, from Union Square down to Broome street. It is believed that these lamps utilize more of the gas, as they tend to reflect the rays around instead of allowing them to shoot upwards. These lamps have already been introduced in the public parks, much to the improvement of the scenery, and the appearance of Broadway will be enhanced in a like proportion. Although the cost of these lams is $6.25 each against $3.25 for the old ones, the Commissioner of Public Works is satisfied that they are cheaper in the end.—*American Artisan.*

PRICES OF FOREIGN AND DOMESTIC GAS COALS.

[Reported Expressly for this Journal.]

May 16, 1872

DELIVERED IN NEW YORK.

English Cannel.			
Ince Hall	$13 00	@	13 50
Kirkless Hall	12 50	@	13 00
English Caking Coals.			
Newcastle Gas	$7 50	@	7 75
Liverpool caking	7 25	@	7 10
British Province Coals.			
International—At Mines, $2 00 in currency	—		—
Block House—At Mines, $1 50, Gold			6 25
Little Glace Bay—At Mines, 1 60 Gold	—		—
Pennsylvania Coals.			
Penn Gas Coal—Delivered in New York	$6 87½	@	7 10
Westmoreland	6 87½	@	7 10
Shafton	7 10	@	— —
Youghiogheny	7 25	@	0 00
West Virginia Coals.			
Murphy Run	$6 75	@	0 00
Despard	6 75	@	0 00
West Fairmont	6 87½	@	7 00
American Gas Coal	6 62½	@	6 75
Fairmont	6 75	@	0 00
Newburgh Orrel	6 75	@	0 00
Pinnickinick	6 75	@	0 00
Cloverhill of Virginia	5 25	@	5 50
McKenzie Compound Mixture			8 00
American Cannel Coals.			
Peytona of West Virginia	$14 00	@	14 50
Darlington of Pennsylvania	— —		— —
American Cannel	$10 00	@	10 50
Asphalts.			
Albertite of New Brunswick	$18 00	@	18 00
Ritchie Mineral of West Virginia	16 00	@	16'00
Trinidad Bitumen	— —	@	14 05

Advertisers Index.

☞ In looking for advertisements, see figures 1 to 12, within brackets, at head of advertisement pages.

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American Meter Co.—West 22nd st., N. Y., Arch and 22d st., Phil., 23 West st., Boston ... 6
Agency for the Gibson Improvement—W. H. Grenelle, 41 Pine street, N. Y. ... 9
Cast Iron Gas and Water Pipe—Smith & Ellis, York and Meyer streets, Phila., Pa. ... 4
Cast Iron Gas and Water Pipes—R. D. Wood & Co., Philadelphia Pa. ... 7
Cast Iron Gas and Water Pipe—Henry G. Nichols, 14 Platt street, New York ... 5
Cast Iron Gas and Water Pipe—Jno. McNeal & Sons, 117 Broadway, N. Y. ... 1
Gas-Burners—C. Gefrorer, 259 Commerce st., Philadelphia, Pa. ... 6
Gas Purification—St. John and Cartwright ... 6
Gas Meter Manufacturers—Harris & Bro., 1117 Cherry st., Philadelphia, Pa. ... 6
Gasometers, Etc.—Geo. Stacey & Co., Cincinnati, O. ... 2
Gas Fixtures, Etc.—Mitchell, Vance & Co., 597 Broadway ... 4
Gasholders, Etc.—Delly & Fowler, 39 Laurel st., Philadel. ... 4
Gas and Water Pipes—B. S. Benson & Son, Allentown, Pa. ... 5
Gasometers, &c.—Keystone Iron Works—2132 Filbert st., Philadelphia ... 4
Gas Apparatus, &c.—Blanchard & Arnold, Fourth and Fowler sts., Milwaukee, Wis. ... 7
Gas Screens—American Gas Screen Manufacturing Co., Haverhill, Mass. ... 3
Jersey City Gas Meter Works, 14 Morris st., Jersey, N. J. ... 3
Northwestern Gas and Water Pipe Co.—646 Wabash Ave., Chicago, Ill. ... 7
Patent Conically Slotted Wood Trays—John L. Cheesman, 147 and 149 Avenue C., N. Y. ... 5
Patent Gas Exhauster—Smith & Sayre, 95 Liberty street. ... 9
The Gas Light Co. of America—Box 5220, New York city ... 4

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Despard Coal Co.—Parmelee & Bros., Agents, 32 Pine st., N. Y. ... 4
Gas Coals—Bird, Perkins & Job, 86 South st., N. Y. ... 5
Grahamite or Ritchie Mineral—27 South Charles street, Baltimore, Md. ... 8
Ohio Gas Cannel—George Merryweather, 5½ Pine street, New York ... 3
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Continental Works—T. F. Rowland, Greenpoint ... 5
Camden Iron Works, Camden, N. J.—Jesse W. Starr & Sons ... 7
Gloucester Iron Works—J. P. Michellon, Sec., 6 North 7th street, Phila., Pa. ... 2
Louisville Pipe Works—Dennis Long, cor. 9th and Water sts., Louisville, Ky ... 7
National Foundry and Pipe Works—Wm. Smith, Carroll, Pike, Smallman & Wilkins streets, Pittsburg, Pa. ... 5
Pascal Iron Works—Morris, Taskar & Co., Philadelphia ... 19
Providence Steam and Gas Pipe Co., Providence, R. I.—H. A. Branch, Agent ... 4

WATER METERS, PUMPS, ETC.

Aubin Water Meter—H. Q. Hawley, Albany, N. Y. ... 6
Cast Iron Pipes for Water and Gas—Riley A. Brick, 89 White street, N. Y. ... 6
Valves for Water, Steam and Gas—Ludlow Valve Man'g Co., 193 River street, Troy, N.Y. ... 5
Water Pipes, etc.—S. Fulton & Co., 412 Walnut st., Phila. ... 6

CLAY RETORT WORKS.

B. Kreisher, Clay Retorts, etc., 58 Goerck st., New York ... 8
Clay Retorts, Fire Brick, Tiles, etc.—Wilson & Gardner, Lockport, Westmoreland Co., Pa. ... 8
Cheltenham Fire Brick and Clay Retort Works—Evens & Howard, 100 South Eleventh street, St. Louis, Mo. ... 6
Jersey City Fire Brick Works—J. H. Gautier & Co., Greene Essex and Bergen sts., Morris Canal Basin, N. J. ... 8
Laclede Fire Brick Works, 107 North Levee, St. Louis, Mo. ... 8
Manhattan Clay Retort Works, 15th st., near Av. C, N. Y. ... 8
Philadelphia Fire Brick Works, Vine and 23d sts., Phila. ... 8
Retorts, Etc.—Geo. C. Hicks & Co., Baltimore Md. ... 6

LAMPS, STOVES, PETROLEUM, ETC.

Patent Lamp Post—J. W. Graham, Chillicothe, Ohio, or A. M. Callender, office of this Journal ... 9

MISCELLANEOUS.

Architect and General Gas Engineer—William Farmer, 111 Broadway Room 91 ... 3
A Synopsis of British Gas Lighting—Jas. R. Smedberg, San Francisco, Cal. ... 4
American Journal of Science and Arts—Silliman and Dana, New Haven Conn. ... 7
Contractors for Gas Works, Etc.—Murray & Baker, Fort Wayne, Ind. ... 2
Curley's Improved Retort Setting and Independent Damper—Thos. Curley, Wilmington, Del. ... 8
Fodell's System of Bookeeping—A. M. Callender & Co., 42 Pine st., New York ... 8
Journal of the Franklin Institute—Prof. W. H. Wahl, Franklin Inst., Phila., Pa. ... 4
On the Advantages of Gas for Cooking and Heating—Magnus Ohren, Lower Sydenham, London, S. E. ... 5
School of Mines, Columbia College, East 49th st. ... 5
Scientific and Chemical Expert—Prof. H. Wurtz, 26 Pine street, room 36, N. Y. ... 7
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Works upon Gas—D. Van Nostrand, 23 Murray street and 27 Warren street, N. Y. ... 9

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1½ to 48 inches diameter.

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Fire Hydrants,

GAS HOLDERS.

TELESCOPIC OR SINGLE.

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Kansas City, Mo., Gas Co.	Bowling Green, Ky., Gas Co.
Topeka, Kansas, Gas Co.	Hamilton, Ohio, Gas Co.
Burlington, Iowa, Gas Co.	Vicksburg, Miss., Gas Co.
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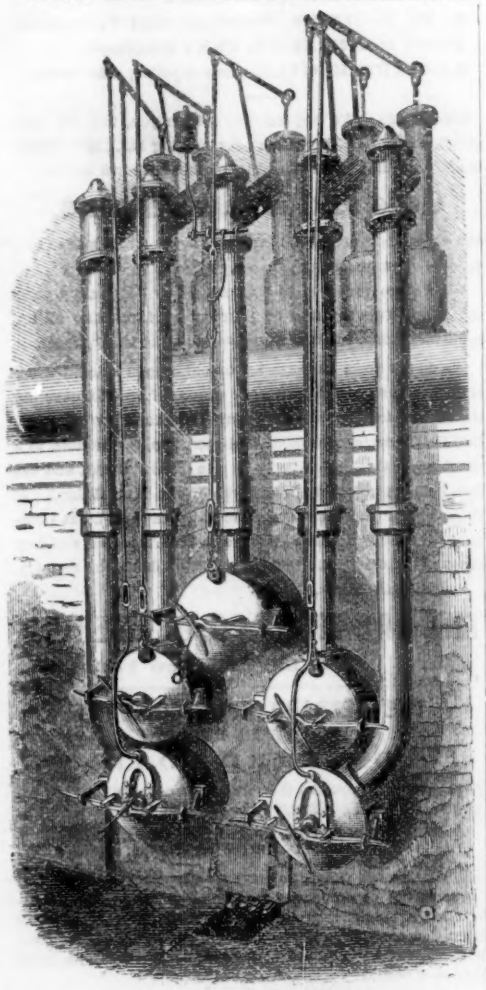

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ADJUSTABLE AUTOMATIC DIP-SEAL,
AND
Improved Retort Lids.

[Described in this Journal of April 16, 1872.]

The Seal closes automatically, when the retort-lid is removed, and is broken by replacing the lid. No mistake can possibly be made. The rods are adjustable in a moment to any contingency. The new attachments are adaptable to any Works. Cost only that of rough castings. No lute used, and no leakage at lids. Half the number of lids only needed. Capacity of mains greatly increased. In new Works no mains. No carbon in retorts, seldom in stand-pipes. 296unl

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From the Sterling Colliery.

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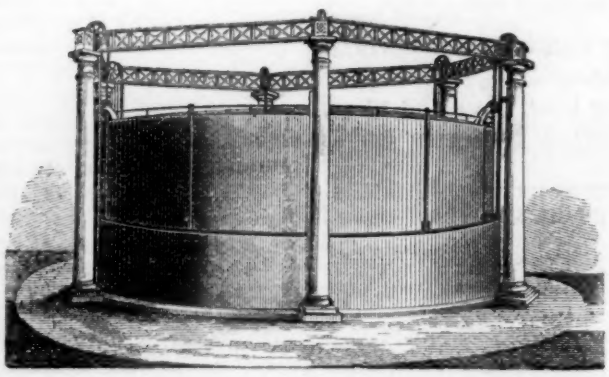

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FURNISHED WITH LONG OR D HANDLES

Perfect in their operation. Very strong, and from their great durability vastly more economical than any substitute. Refer to all the principal Gas Companies in the country, who acknowledge them as the "ne plus ultra" of Coke Screening Shovels.

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E. W. McGINNIS, Secretary and Treasurer.
JOHN P. KENNEDY, Chief Engineer.
LEONARD D. GALE, Consulting Chemist.

GENTLEMEN: We beg leave to inform you, that we have purchased the Patent process for making ILLUMINATING GAS from PETROLEUM and its products, known as the

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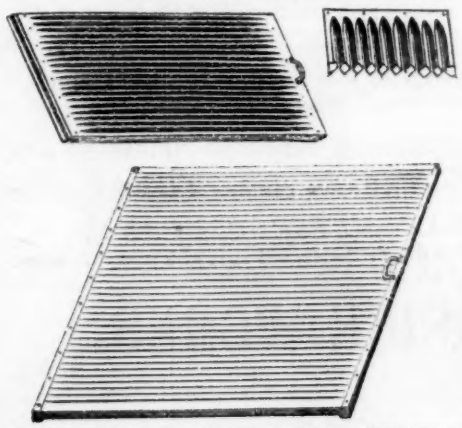

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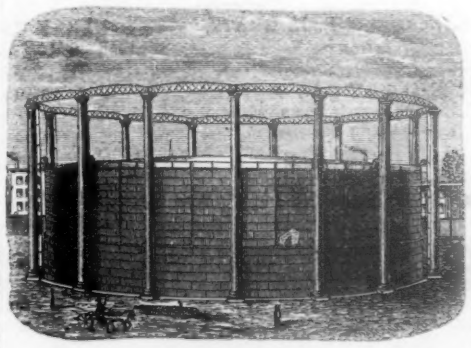

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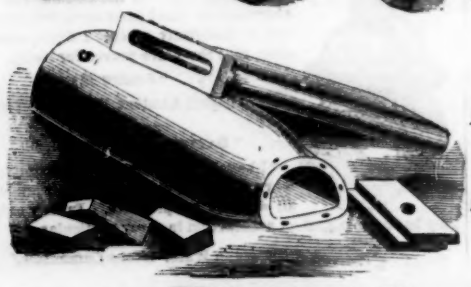

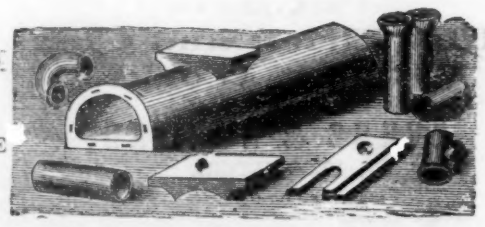

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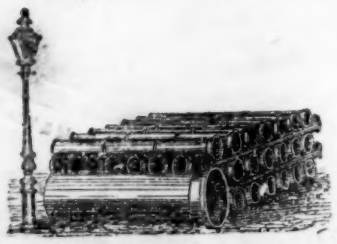

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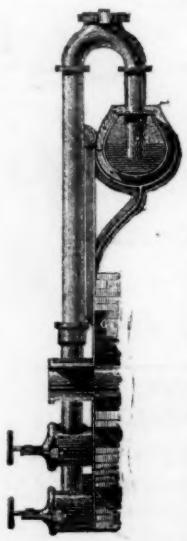

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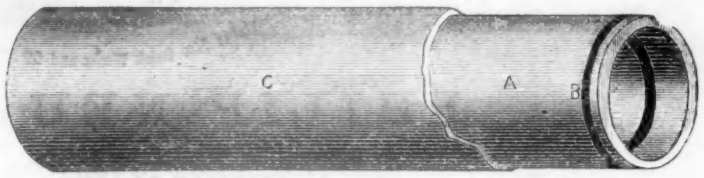

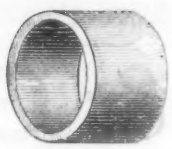

FIG. 2.

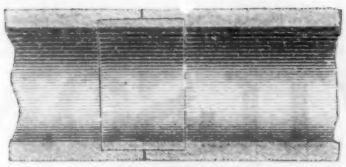

FIG. 3.

A—Cylinder of Wood. B—Band of Iron. C—Coating of Hydraulic or Asphaltum Cement.

FIG. 2.—Thimble for Connection. FIG. 3.—Horizontal Section and Connection.

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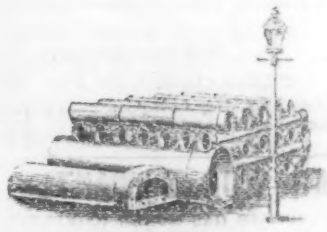

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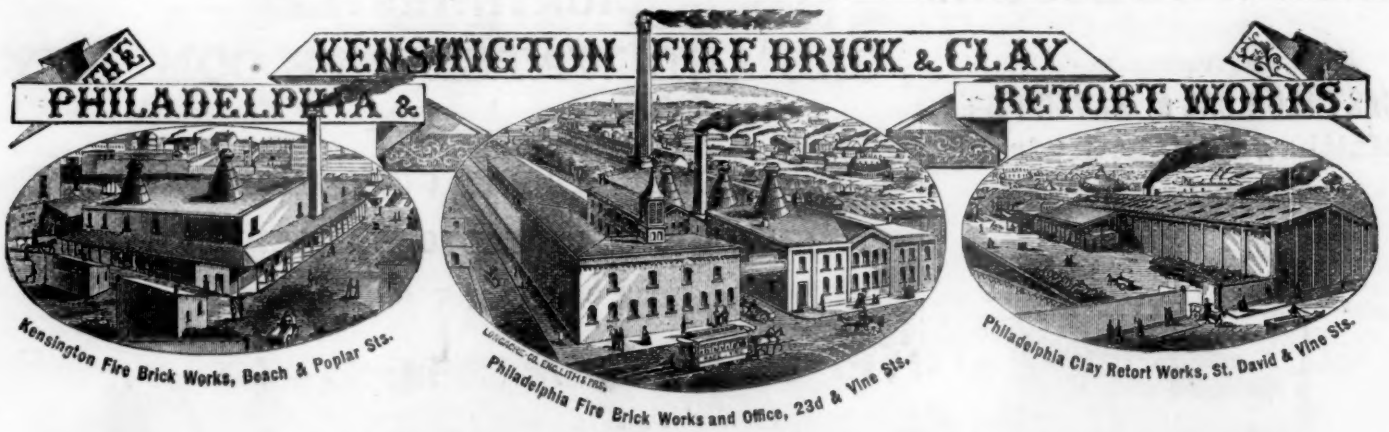
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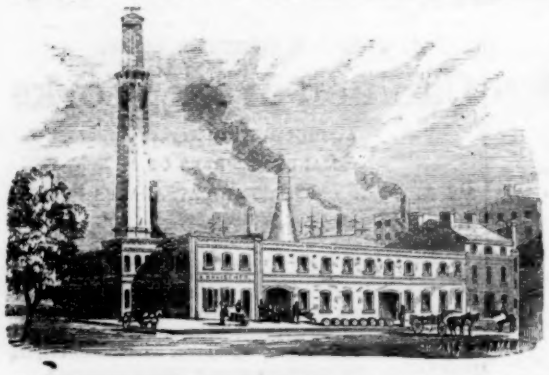

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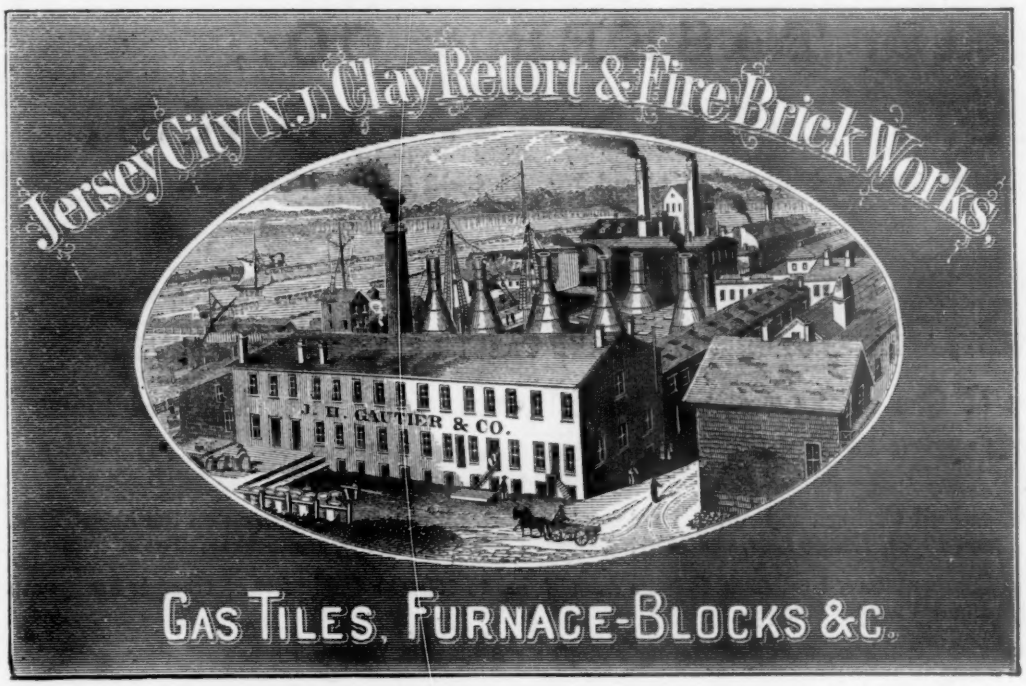

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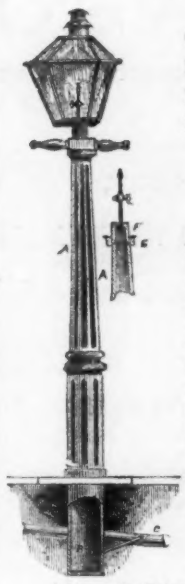

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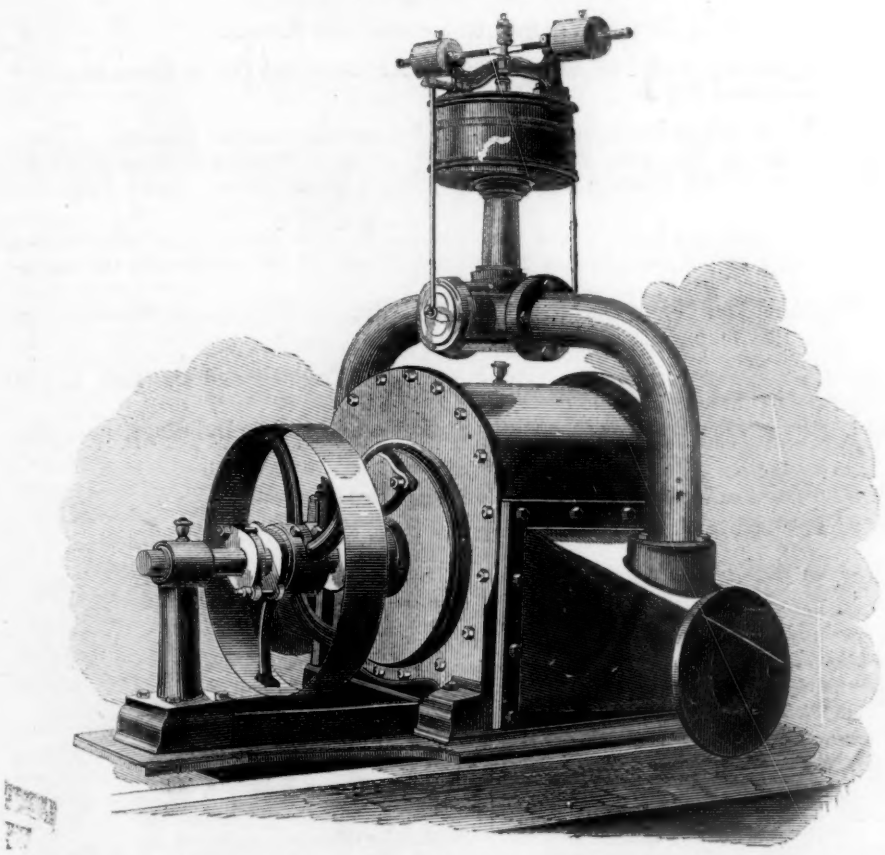

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